JSW Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
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Website : www.jsw.in

No. JSW/S/CO/2023/299 Date: 30/05/2023

To,
The Deputy Director General of Forests (C),
Ministry of Environment, Forest and Climate Change,
Regional Office (Eastern Zone),
A/3, Chandersekharpur, Bhubaneswar – 751023

Sub: - Submission of Six-monthly EC compliance report in respect of **Jajang Iron Ore Mine of M/s JSW Steel Ltd for the period October 2022 to March 2023.**

Ref: - 1. Vesting Order dated 29th May 2020 issued by GoO, Steel and Mines Department.
2. Environment Clearance Letter dated 13.03.2015 and amendment dated 09.11.2015 issued by MOEF&CC, GOI.

Dear Sir,

We are submitting herewith six-monthly EC compliance report of Jajang Iron Ore Mine, M/s JSW Steel Ltd. for the period October 2022 to March 2023 as per EIA notification 2006.The same is also attached in Soft copy to your good office on e-mail to roez.bsr-mef@nic.in; for your ready reference.

We trust that the measures taken towards environmental safeguards comply with the stipulated conditions. We look forward to your guidance which shall certainly help us in our endeavor for improving upon our environmental management practices.

Seeking your co-operation as always.

Thanking you,

Yours Faithfully
For JSW Steel Ltd

Baswaraj M Dalgade
(Authorized Signatory)

Encl: As above

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Copy to:

1. The Member Secretary, Central Ground Water Authority, Government of India, Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Bhujal Bhawan, CGO Complex, NH-IV, Faridabad- 121 001.
2. Zonal Office Kolkata, Central Pollution Control Board, South end Conclave, Block 502, 5th and 6th Floors, 1582 Razidanga Main Road, Kolkata, West Bengal 700107.
3. The Regional Director, Central Ground Water Board, South Eastern Region, Bhujal Bhawan, Khandagiri Square, NH-5, Bhubaneswar, Odisha, Pin- 751001
4. The Member Secretary, State Pollution Control Board, A/118, Nilakantha Nagar, Bhubaneswar, Odisha-751012.
5. The Regional Officer, State Pollution Control Board, Baniapat, DD College Road, Keonjhar, Odisha-758001.

ENVIRONMENT CLEARANCE COMPLIANCE STATUS -JAJANG MINE

Six Monthly Compliance report of Environmental Clearance for Jajang Iron Ore Mine, JSW Steel Ltd. for the period from- October 2022 to March 2023.

Reference letter from MoEF&CC, New Delhi- J-11015/96/2012-IA. II(M), Dtd. 13.03.2015 and 09.11.2015.

Capacity- 16.5 MTPA of iron ore (12.8 MTPA ROM by fresh excavation + 3.7 MTPA by rehandling of low grade old dump/ mineral stacks).

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A. Specific Conditions

Sl. No.	Specific Conditions	Compliance
i	The dump height should be maintained upto 60 meter and overall slope of the dump shall be upto 30°.	Being complied. The active dump height is around 26 meter and well within the limit and as per approved modified mine plan, ultimate angle of repose of 28^0 will be maintained once the dump stabilized.
ii	The project proponent shall obtain Consent to Establish and Consent to Operate from the State Pollution Control Board, Odisha and effectively implement all the conditions stipulated therein.	Being Complied. CTE and CTO have been vested to JSW Steel Ltd for 2 years. New CTE vide letter no 5113/IND-II-CTE-6463 dated 26.03.2021 and CTO vide letter no 4232/IND-I-CON-247 dated 17.03.2022 have been obtained from OSPCB.
iii	Environmental clearance is subject to obtaining clearance under the Wildlife (Protection) Act, 1972 from the competent authority, as may be applicable to this project.	No Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor within the core as well as within the buffer zone of the project. TOR has been approved dated 05.02.2021 for new EC and EIA report is under progress and will obtain if required. The report for the same has been attached as **Annexure V.**
iv	The project proponent shall obtain prior approval of the competent authorities for drawl of requisite quantity of surface water and ground water for the project before commencing the mining activity.	NOC from CGWA for 1000 m3/day or 365000 m3/year is already vested to JSW for 2 years and valid up to 08/12/2023 vide NOC number CGWA/NOC/MIN/REN/2/2020/5639. The report for the same has been attached as **Annexure III**.
v	No mining activities are allowed in forest area for which the FC is not available.	The present mining operation is restricted within vested Forest area only as per FC F.No.8-88/98-FC, Dt:21.07.2000 over 44.70 ha and F.No.8-88/98-FC (Vol), Dt:28.08.2014 over 447.811 ha (Including 44.70 ha forest land already diverted). FC Proposal applied for 543.916 ha vide Lr No: FP/OR/MIN/50705/2020 dated 09.10.2020 and same is under evaluation. Advance NPV has already been paid.

		Further, as per MMDR Amendment Act 2021, the Forest clearances and other permissions continue to be valid even after expiry or permission of lease till the minerals exhausted. Hence, the Forest Clearance for 447.811 ha (Including 44.70 ha forest land already diverted) will be valid till life of the mine.
vi	The condition 3(iii)b of the guidelines issued by the Forest Conservation Division in this I Ministry vide F. No. 1 1-362/2012-FC dated 1st February, 2013 is not being prescribed in view of Hon'ble Supreme Court order dated 27.01.2014 and the EC is subject to the final order of the Supreme Court in the matter.	New FC Proposal applied for 543.916 ha vide Lr No: FP/OR/MIN/50705/2020 dated 09.10.2020. Advance NPV has already been paid. Further, as per MMDR Amendment Act 2021, the Forest clearances and other permissions continue to be valid even after expiry or permission of lease till the minerals exhausted. Hence, the Forest Clearance for 447.811 ha (including 44.70 ha forest land already diverted) will be valid till life of the mine
vii	Traffic density on the route of mineral transportation shall be regularly monitored and report shall be submitted along with compliance report.	Being complied. Iron ore lumps and iron ore fines extracted from the mine is being transported through railway/road/port to JSW & other Steel Plants. There are two nos of railway siding namely RMJC-JSW Railway Siding and part of BIL Siding existing within the ML area. These sidings are being used for transportation of ore of Jajang mine. Commercial notification of JSW RMJC Siding has been issued by SER, Kolkata in favour of M/s JSW Steel Ltd on 02.11.2020.
viii	As part of ambient air quality monitoring during operational phase of the project, the air samples shall also be analyzed for their mineralogical composition and records maintained.	Regular monitoring of ambient air quality parameters along with mineralogical composition being carried out and Monitoring Reports are attached as **Annexure 1**. Vendor isa recognized NABET, MoEF & CC accredited laboratory.
ix	Mineral handling plant shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.	Dust Suppression System (Dry fog system) being provided at all appropriate places of mineral handling plants (crusher & screening plant) and other areas. Same are being properly maintained and operated for proper dust control.

		 DRY FOG SYSTEM
x	Effective safeguard measures such as conditioning of ore with water, regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of particulate matter such as around crushing and screening plant, loading and unloading point and transfer points. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.	Regular water sprinkling through mobile water sprinkler tankers being carried out on haul roads and nearby mineral dispatch roads (express highway) to avoid generation of dust during movement of vehicles. Fixed auto sprinklers on both sides of major haul road and approach roads are being functioning.  FIXED WATER SPRINKLING Regular maintenance of Haul roads is being carried out to avoid generation of dust during movement of vehicles. Regular monitoring of ambient air quality parameters being carried out and data is well within the limit prescribed.AAQ Monitoring reports are attached as **Annexure 1**.
xi	The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.	Maximum rain water has already been channelized to Mine Pits and same is being utilized in dust suppression and other mining activities.

		Existing Retention wall, Garland drains, Check Dams and setting pits are being maintained. Detailed Hydrology study is under progress, recommendations of the study and consultation with CGWB, additional rain water harvesting measures/structures will be implemented for rainwater harvesting.  CHECK DAM, 40000 cum CAPACITY
xii	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and installing new piezo meters during the mining operation. The periodic monitoring [(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)] shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office Bhubaneswar, the Central Ground Water Authority and the Regional Director, Central Ground Water Board. If at any stage, it is observed that the groundwater table is getting depleted due to the mining activity; necessary corrective measures shall be carried out.	Regular monitoring of ground water level and quality being carried out and Monitoring Reports of pre monsoon (March-April 2023) and winter season (November-December 2022) are attached as **Annexure 1**. Vendor is a recognized NABET, MoEF & CC accredited laboratory.
xiii	The project proponent shall regularly monitor the flow rate of the natural water streams Jalpa, Kakrapani Nallah and Baitarni river and the Suna nadi flowing adjacent to the mine lease and maintain the records.	Being complied and monitoring reports of flow rate of natural water streams are attached as **Annexure 1**.
xiv	The reclaimed and rehabilitated area shall be afforested. Monitoring and management of rehabilitated areas shall	Being Complied. Around 44.62 ha of land has been backfilled by ex-lessee (M/s Rungta Pvt Ltd). As per approved modified mine plan,

	continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis.	during the plan period an area of 22.56 Ha will be backfilled. Thus the total backfilling area at the end of plan period will be 67.18 ha. It has been planned to reclaim the mined out area by Back-filling and plantation/re-grassing in the conceptual period and compliance status of the same will be submitted to RO, MOEF&CC on six monthly basis.
xv	Dimension of the retaining wall at the toe of temporary over burden dumps and OB benches within the mine to check run-off and siltation shall be based on the rain fall data.	Being Complied. Existing Retention wall being maintained to prevent any direct flow of runoff to nearby water bodies as per requirement. So far, the retaining wall upto a length of 3323 m around the dump, backfilling area etc has been constructed by by erstwhile lessee (M/s Rungta Pvt Ltd) and necessary repair of retaining wall is being undertaken on regular basis. As per approved modified mine plan, back filling site and OB dump area are proposed to be surrounded by retaining wall (1.0m Height) and garland drains (1.0m depth) to prevent any direct flow of runoff to nearby water bodies.
xvi	Plantation shall be raised in a specified area including a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around the higher benches of excavated void to be converted in to water body, roads etc. by planting the native species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per Ha.	Being Complied. More than 14100 saplings (Yearly Plantation of FY 2022-23 and 23-24) have been planted as per approved mine plan in the safety zone, and other areas before monsoon  PLANTATION DURING MONSOON 2022-2023
xvii	Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM and RPM such as haul road, loading and unloading point and transfer points. It shall be ensured that the Ambient Air Quality parameters conform to the	Drills equipped with dust extractors/ equipped with water injection system being operated in mine. Controlled blasting is in place. Dust Suppression System (Dry fog system) being provided at all appropriate places of mineral handling plants (crusher & screening

	norms prescribed by the Central Pollution Control Board in this regard.	plant) and other areas. Same are being maintained for proper dust control. • Regular water sprinkling through mobile water sprinkler tankers being carried out on haul roads and nearby mineral dispatch roads (express highway) to avoid generation of dust during movement of vehicles. Dust suppressant chemicals are being used to control the dust emission on the haul roads, which also reduces the water consumption.  MOBILE WATER SPRINKLING Regular maintenance of Haul roads is being carried out to avoid generation of dust during movement of vehicles. Regular monitoring of ambient air quality parameters being carried out and data is well within the limit prescribed.AAQ Monitoring reports are attached as **Annexure 1**.
xviii	Process water discharge and/or any waste water shall be properly treated to meet the prescribed standards before reuse/discharge. The runoff from temporary OB dumps and other surface run off shall be analyzed for iron and in case its concentration is found higher than the permissible limit, the waste water should be treated before discharge/reuse.	No process water being discharged from the mine. Regular Monitoring of water quality parameters being carried out. Monitoring reports are attached as **Annexure 1**.
xix	The decanted water from the beneficiation plant and slime/tailing pond shall be re-circulated within the mine and there shall be zero discharge from the mine.	Not applicable as there is no EC and CTO available for the beneficiation plant.

xx	Regular monitoring of the flow rate of the springs and perennial nallahs shall be carried out and records maintained.	Being complied and monitoring reports of flow rate of springs and perennial nallahs are attached as **Annexure 1**.

xxi	Regular monitoring of water quality, upstream and downstream of river shall be carried out and record of monitoring data should be maintained and submitted to Ministry of Environment and Forests, its Regional Office, Bhubaneswar, Central Groundwater Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board	Regular monitoring of water quality of upstream and downstream being carried out and Monitoring Reports are attached as **Annexure 1**. Vendor is a recognized NABET, MoEF & CC accredited laboratory.
xxii	Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with Regional Director, Central Ground Water Board.	Maximum rain water has already been channelized to Mine Pits and same is being utilized in dust suppression and other mining activities. Existing Retention wall, Garland drains, Check Dams and setting pits being maintained. Detailed Hydrology study is under progress, recommendations of the study and consultation with CGWB, additional rain water harvesting measures/structures will be implemented for rainwater harvesting. The Report for the same has been attached as **Annexure IV.**
xxiii	Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral from mine face to the beneficiation plant. The vehicles shall be covered with a tarpaulin and shall not be overloaded.	Mineral carrying trucks are not allowed to go out of the lease area without tarpaulin cover and is being monitored by security personnel at the exit gate. Vehicular emissions being regularly monitored. Also, Security personnel are also do not allow the vehicles to enter into the mines without having valid PUC.
xxiv	Sewage treatment plant shall be installed for the colony. ETP shall also be provided for workshop and wastewater generated during mining operation.	Workshop along with ETP/Oil & Grease trap system being provided within lease area. We have taken possession of the colony recently and are in process for revamping of colony along with existing STP in same will be completed phase-wise in time bound manner. Meanwhile the Soak Pits are being used. The monitoring report for the same has been attached as **Annexure I**
xxv	Digital processing of the entire lease area using remote sensing technique shall be carried out regularly once in three years for monitoring land use pattern and report submitted to Ministry of Environment and Forests and its Regional Office, Bhubaneswar.	DGPS Surveyed Mining lease boundary superimposed on High Resolution Satellite image of Jajang Iron Ore Mine duly vetted by M/s ORSAC has been attached as **Annexure II**.
xxvi	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be	Initial Medical Examination & Periodical Medical Examination of the workers engaged in

	carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	the project is being carried periodically and records are maintained. A medical dispensary with full time Doctor has been appointed at mine area for the health check-up of employees and also the locals.
xxvii	The project proponent shall undertake all the commitments made during the public hearing and effectively address the concernsraised by the locals in the public hearing as well as during consideration of the project, while implementing the project.	Jajang Mining operation was started from 1st July 2020 and various community development initiatives are under implementation for community upliftment. Need based assessment survey has been completed and action plan is under implementation for the compliance. TOR has been approved on 05.02.2021 for new EC. EIA report is under progress, will comply after the new public hearing will conduct.
xxviii	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. All the safeguard measures brought out in the Wildlife Conservation Pan so prepared specific to the project site shall be effectively implemented. A copy of action plan shall be submitted to the Ministry of Environment and Forests and its Regional Office, Bhubaneswar.	No Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor within the core as well as within the buffer zone of the project. TOR has been approved dated 05.02.2021 for new EC and EIA report is under progress and action plan for conservation of flora and fauna will be prepared if required. The Site Specific Wild life Conservation plan has been approved by PCCF vide letter number 1842/CWLW-FDWC-FD-0116-2021, Bhubaneshwar, dated 25/02/2022.
xxix	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	Final Mine Closure plan was approved by erstwhile lessee. After the expiry of the lease on 31.03.2020, the lease was put for auction. After getting the lease through auction, mining plan along with progressive mine closure plan has been approved by IBM. As per Approved Modified Mining Plan, iron ore has not been exhausted within the mining lease area. The same will be submitted 2 years prior the exhaustion of ore as per statutes.

B. <u>General Conditions</u>

Sl. No.	General conditions	Compliance
i	No change in Iron Ore Processing/Beneficiation technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	Not Applicable. There is no EC and CTO available for the beneficiation plant.
ii	No change in the calendar plan including Processing/Beneficiation of mineral iron ore and waste should be made.	Noted and Being complied as per approved mine plan. There is no EC and CTO available for the beneficiation plant.
iii	At least four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RSPM (Particulate matter with size less than 10 microns i.e., PM10) and NOx monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board. The data so recorded should be regularly submitted to the Ministry including its Regional office located at Bhubaneswar and the State Pollution Control Board / Central Pollution Control Board once in six months	Regular Ambient air quality monitoringbeing carried out at four AAQ monitoring stations in core zone and four stations inbuffer zone. AAQ monitoring reports are attached as **Annexure 1.**
iv	Measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs / muffs.	Noise producing equipment's are covered as far as practicable. Workers engaged in Operations are provided with ear plugs / muffs. Besides this, acoustic enclosures are provided for all machines operating within the mines. Controlled blasting is in place. Regular Noise Monitoring being carried out and Monitoring reports are attached as **Annexure 1**.
v	There will be zero waste water discharge from the plant.	Not applicable as no EC and CTO available for the beneficiation plant.
vi	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.	Personnel working in dusty areas are provided with nose mask, safety glass and ear plug with proper safety training. Dust Suppression System (Dry fog system) being provided at all appropriate places of mineral handling plants (crusher & screening

		plant) and other areas. Same are being maintained for proper dust control. Pre-placement medical examination and periodical examination of the workers engaged are being conducted & record maintained.
vii	Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure todust and take corrective measures, if needed.	Workers engaged in Operations are provided with PPE's. Besides this, acoustic enclosures are provided for all machines operating within the mines. The noise level is being monitored by Noise Level Meter; the results reveal that the parameter is well within the prescribed norms. Initial Medical Examination & Periodical Medical Examination of the workers engaged in the project are being carried periodically and records are maintained. A medical dispensary with full time Doctor has been appointed at mine area for the health check-up of employees and also the locals.
viii	A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.	A dedicated Environment Management Cell under the leadership of AVP Environment has been formed and reporting to Mine Senior Management i.e. Head of Operations (VP). The report for the same has been attached as **Annexure VI**.
ix	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneswar.	We are in process for implementation of various measures undertaken for environment management plan since the operation started in July 2020. Details of environmental management measures expenditure (head wise breakup) as **Annexure A**
x	The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.	Noted and will be complied.
xi	The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The project authorities	We will extend full co-operation to the officers of the Regional Office during their

	should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.	visit and furnish the required data, information and monitoring reports.
xii	The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the Ministry of Environment and Forests, its Regional Office Bhubaneswar, the respective Zonal Office of Central Pollution Control Board and the State Pollution Control Board. The proponent shall upload the status of compliance of the environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the Ministry of Environment and Forests, Bhubaneswar, the respective Zonal Officer of Central Pollution Control Board and the State Pollution Control Board.	Being complied. Last six-monthly compliance report along with monitoring data vide letter no JSW/S/O/2022/842 dated 30.11.2022 was submitted to Regional Office, MOEF&CC, Bhubaneswar, Zonal Office, CPCB, Kolkata, MS and RO Offices SPCB, Odisha. EC Compliance report along with monitoring data being uploaded in company website.
xiii	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad/ Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.	Noted
xiv	The State Pollution Control Board should display a copy of the clearance letter at the regional office, District Industry Centre and the Collector's office/ Tehsildar's Office for 30 days.	State Pollution Control Board/ Committee has displayed EC letter at its regional office, District Industry Centre and the Collector's office/ Tehsildar's Office.
xv	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Office of the Ministry of	Will be complied within timeline.

	Environment and Forests, Bhubaneswar by e-mail.	
xvi	The project authorities should advertise at least in two local newspapers of the District or State in which the project is located and widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web siteof the Ministry of Environment and Forests at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.	It has been published in two local newspapers of the District.

ANNEXURE I

ECOMEN LABORATORIES PVT. LTD.
Second Floor Hall, House No. B-1/8, Sector-H, Aliganj, Lucknow - 226 024
Phone No. : 0522 - 4079201/2746282
E-mail: contactus@ecomen.in, Website: www.ecomen.in, CIN - U74210UP1989PTC010601,GSTIN : 09AAACE6076H1ZI
An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5871/11/2022**
		Issue Date of Test Report	**23.11.2022**
Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Dugwell Near Bil Siding
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5871/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	BDL	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.79	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	116.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	60.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	72.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.0	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	7.77	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	21.6	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	7.8	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.27	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.20	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	0.10	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	0.21	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	BDL	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	BDL	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	BDL	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	Absent	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested.**Note: -** BDL- Below Detection Limit

Verified By
Technical Manager

----End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
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An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5866/11/2022**
		Issue Date of Test Report	**23.11.2022**
Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Kamalpur Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5866/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	Agreeable	Qualitative	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	BDL	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.98	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	144.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	48.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	56.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	12.8	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	5.83	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	13.4	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	5.12	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.25	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.20	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	0.10	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	BDL	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	<5.0	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	Agreeable	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	Agreeable	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	BDL	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested.**Note: -** BDL- Below Detection Limit

Verified By
Technical Manager

----End of Report----

Authorized By
Quality Manager
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An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of** **M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5867/11/2022**
		Issue Date of Test Report	**23.11.2022**

Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Jajang Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5867/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	Agreeable	Qualitative	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	BDL	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.77	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	180.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	76.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	88.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.0	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	11.66	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	18.6	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.25	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	10.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.21	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.09	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	0.05	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	0.20	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	BDL	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	BDL	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	BDL	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	Absent	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit

Verified By
Technical Manager

----End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5868/11/2022**
		Issue Date of Test Report	**23.11.2022**
Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Jurudi Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5868/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	Agreeable	Qualitative	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	BDL	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.90	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	163.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	60.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	76.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	19.2	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	6.80	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	13.5	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	5.33	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.21	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.12	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	0.08	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	BDL	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	BDL	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	BDL	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	BDL	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	Absent	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested.**Note: -** BDL- Below Detection Limit

Verified By
Technical Manager

---End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of** **M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5869/11/2022**
		Issue Date of Test Report	**23.11.2022**
Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Jalahari Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5869/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	BDL	Qualitative	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	Agreeable	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.78	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	123.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	56.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	68.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	12.8	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	8.74	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	15.2	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	5.22	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.24	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.10	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	BDL	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	BDL	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	BDL	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	BDL	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	Absent	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit

Verified By
Technical Manager

----End of Report----

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An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/07

NAME & ADDRESS OF CUSTOMER:	**Jajang Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECOLAB/DW/0665/5870/11/2022**
		Issue Date of Test Report	**23.11.2022**
Type of Sample	Ground Water		
Sample Registration No.	665	**Name of Location**	Tap Water Near Jajang Mine
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	14.11.2022	**Time of Sample Collection**	-
Date of Sample Received	17.11.2022	**Time of Sample Received**	10:45 AM
Start Date of Analysis	17.11.2022	**End Date of Analysis**	23.11.2022
Laboratory Environmental Condition	Temperature: 25 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 65 %	**Sample ID Code**	ECO/LAB/5870/11/2022

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	Colour	Hazen	APHA, 23rd Ed. 2017, 2120 B	<5.0	5-100	5.00	15.0
2.	Odour	-	APHA, 23rd Ed. 2017, 2150 B	Agreeable	Qualitative	Agreeable	Agreeable
3.	Taste	-	APHA, 23rd Ed. 2017, A+B	Agreeable	Qualitative	Agreeable	Agreeable
4.	Turbidity as	NTU	APHA, 23rd Ed. 2017, 2130-A+B	BDL	1 - 100	1.0	5.0
5.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.73	2.0 -12	6.5-8.5	No Relax.
6.	Total Suspended Solids as TSS	mg/l	APHA, 23rd Ed. 2017, 2540-C	BDL	5 - 5000	-	-
7.	Total Dissolved Solids as TDS	mg/l	APHA, 23rd Ed. 2017, 2540-C	114.0	5 - 5000	500	2000
8.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	40.0	5-1500	200	600
9.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	52.0	5-1500	200.0	600.0
10.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	14.4	5 – 1000	75.0	200.0
11.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	3.88	5-1000	30.0	100.0
12.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	16.5	1.0 -250	200.0	400.0
13.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.78	5.0 - 100	45.0	No Relax.
14.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	14.0	5-1000	250.0	1000.0
15.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.30	0.05-10	1.0	1.5
16.	Copper as Cu	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.05-5	0.05	1.5
17.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.12	0.02-50	0.3	No Relax.
18.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
19.	Arsenic as As	mg/l	APHA, 23rd Ed. 2017, 3114 C	BDL	0.01-2	0.01	0.05
20.	Zinc as Zn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	0.06	0.02-50	5.0	15
21.	Total Chromium as Cr	mg/l	APHA, 23rd Ed. 2017, 3111A+B	BDL	0.05-20	0.05	No Relax.
22.	Phenolic Compounds as C_6H_5OH	mg/l	APHA, 23rd Ed. 2017, 5530 A+C	BDL	1-10	0.001	0.002
23.	Free Residual Chlorine	mg/l	APHA, 23rd Ed. 2017, 4500-Cl B	BDL	0.5-10	0.20	1.0
24.	Selenium as Se	mg/l	APHA, 23rd Ed. : 2017, 3500 Se A+C	BDL	0.02-10	0.01	No Relax
25.	Aluminum as Al	mg/l	APHA, 23rd Ed. : 2017, 3500 Al A+B	BDL	0.2-100	0.03	0.2
26.	Mercury as Hg	mg/l	APHA, 23rd Ed. : 2017, 3112 A+B	BDL	0.001-1	0.001	No Relax
27.	Lead as Pb	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.01-1	0.01	No Relax
28.	Cadmium as Cd	mg/l	APHA, 23rd Ed. : 2017, 3111 A+B	BDL	0.002-2	0.003	No Relax
29.	Boron as B	mg/l	APHA, 23rd Ed. : 2017, 4500 B A+C	0.21	0.2-10	0.5	1.0
30.	Cyanide as CN	mg/l	APHA,23rd Ed.2017, 4500 ,CN A+D	BDL	0.005-5	0.05	No Relax
31.	Mineral Oil	mg/l	IS 3025 (Part 39) Class -6	BDL	0.01-10	0.5	No Relax.
32.	Anionic detergent as MABS	mg/l	APHA, 23rd Ed. 2017, 5540 A+C	BDL	0.01-5	0.2	1.0
33.	Polynuclear aromatic hydrocarbon as PAH	mg/l	APHA, 23rd Ed. 2017, 6440 A+B	BDL	0.0001-2	0.0001	No Relax.
34.	E. Coli	cfu/100 ml	APHA, 23rd Ed. : 2017, 9221 A+E	Absent	1.8	Absent	Absent

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested.**Note: -** BDL- Below Detection Limit.

Verified By
Technical Manager

----End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
Second Floor Hall, House No. B-1/8,
Sector-H, Aliganj, Lucknow-226024

SUMMARY

OF

ENVIRONMENTAL MONITORING REPORT

(OCTOBER 2022 TO MARCH 2023)

FOR

JAJANG IRON ORE MINE

DISTRICT—KEONJHAR, ODISHA

OF

M/S JSW STEEL LIMITED, ODISHA

ENV MONITORING CARRIED OUT

BY

ECOMEN LABORATORIES PVT.LTD

Ecomen Laboratories Pvt. Ltd.
(An approved Laboratory from MoEF & CC & NABL)
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Environmental Monitoring Report- Jajang Iron Ore Mines of M/s JSW Steel Limited, Odisha during the period (October 2022 to March 2023)

1. Ambient Air Quality Lease Area

Si. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ lug/m^3	SO_2 lug/m^3	NO_2 lug/m^3	CO mg/m^3
1.	Near Mines Office	October ’22	Maximum	55.6	18.4	14	18.4	0.59
			Minimum	41.5	12.9	10.1	13.9	0.42
			Average	46.4	15.8	12.0	16.3	0.5
		November ’22	Maximum	42.4	16.8	14.9	17.9	0.5
			Minimum	35.3	13.4	12.1	13.2	0.42
			Average	39.2	15.0	13.6	15.9	0.5
		December ’22	Maximum	46.6	15.9	15.9	17	0.5
			Minimum	39.5	12	13.2	13.1	0.42
			Average	42.9	13.9	14.2	14.9	0.5
		January’23	Maximum	58.8	20	17	17.8	0.5
			Minimum	52	13.3	14.1	15.2	0.41
			Average	56.0	16.2	15.7	16.6	0.5
		February ’23	Maximum	70.8	21.8	17.9	17.8	0.5
			Minimum	65.3	14.3	14	15.1	0.41
			Average	67.5	16.8	15.3	16.3	0.5
		March ’23	Maximum	74.6	29.1	14.7	28.5	0.96
			Minimum	52.3	16.2	10.3	21	0.61
			Average	59.9	20.7	12.1	24.5	0.8
		October ’22	Maximum	42.9	16.9	14.9	17.9	0.5
			Minimum	35.2	12.1	12.1	14.1	0.41
			Average	39.1	15.0	13.3	16.1	0.5

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	PM2.5 lug/m^3	SO2 lug/m^3	NO2 lug/m^3	CO mg/m^3
2.	Entry And Exit Gate	November ’22	Maximum	73.8	23.2	21.70	23.6	0.65
			Minimum	60.3	16.5	11.6	18.6	0.42
			Average	55.3	15.8	16.8	17.1	0.5
		December ’22	Maximum	46.9	16	15.9	16.8	0.5
			Minimum	39.3	12.2	13.1	13	0.41
			Average	43.1	14.4	14.5	14.6	0.5
		January ’23	Maximum	57.6	19.5	16.9	17.9	0.49
			Minimum	52	13.1	14.1	15	0.41
			Average	54.6	16.4	15.5	16.5	0.5
		Febuary'23	Maximum	70.9	21.6	16.8	17.9	0.5
			Minimum	65.2	14.8	14.2	15.1	0.41
			Average	67.6	18.0	15.6	16.4	0.5
		March'23	Maximum	71.6	28.5	16.7	28.2	0.92
			Minimum	54.7	18.5	10.3	21.3	0.65
			Average	61.9	21.7	13.7	23.8	0.8
3.	Guest House	October ’22	Maximum	55.4	17.2	13.7	18.5	0.56
			Minimum	43.2	13.8	10.5	13.8	0.44
			Average	48.2	15.4	11.9	16.3	0.5
		November’22	Maximum	41.7	16.5	14.9	17.7	0.5
			Minimum	35.2	13.3	12.1	14.2	0.41
			Average	38.1	15.0	13.4	15.6	0.5
		December’22	Maximum	47	15.7	16	16.9	0.5
			Minimum	39.2	12.2	13.2	13.3	0.41
			Average	43.3	13.9	14.3	15.3	0.5
		January’23	Maximum	58.9	19.8	17	18	0.49
			Minimum	52	13.4	14.1	15	0.41
			Average	55.9	17.2	15.5	16.7	0.5

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
		Febuary'23	Maximum	65.1	14.1	14.1	15	0.41
			Minimum	67.6	17.5	15.6	16.4	0.5
			Average	70.6	24.6	17.5	26.5	0.91
		March'23	Maximum	54.7	18.5	10.3	21.3	0.58
			Minimum	60.9	21.1	13.5	23.4	0.8
			Average	65.1	14.1	14.1	15	0.41
4.	Near Work Shop	October '22	Maximum	51.2	17.2	14.5	17.9	0.58
			Minimum	43.1	13.2	10.2	13.4	0.46
			Average	46.1	15.2	12.1	16.0	0.5
		November '22	Maximum	43.8	17.6	15.4	18.2	0.5
			Minimum	35.4	13	12.3	14.2	0.41
			Average	39.2	15.0	13.9	15.8	0.5
		December '22	Maximum	46.9	15.9	15.7	16.9	0.5
			Minimum	39	12.1	13.2	13.1	0.42
			Average	42.3	14.1	14.4	14.7	0.5
		January'23	Maximum	58.9	19.9	17	18	0.5
			Minimum	52	13	14.1	15.1	0.41
			Average	55.3	16.2	15.4	16.6	0.5
		February '23	Maximum	70.8	21.5	16.9	18.1	0.5
			Minimum	65.4	12.5	14	15	0.41
			Average	67.6	17.2	15.5	16.5	0.5
		March '23	Maximum	86.1	38.6	20.7	39	0.87
			Minimum	58.2	24.6	13.88	31.1	0.46
			Average	74.4	32.3	17.3	35.0	0.7
CPCB Standard			**24 Hrly**	**100**	**60**	**80**	**80**	**4 (1Hrly)**
			Annual Average	**60**	**40**	**40**	**50**	**--**

2. Ambient Air Quality Buffer Area

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ lug/m^3	SO_2 lug/m^3	NO_2 lug/m^3	CO mg/m^3
1.	Jajang Village	October ’22	Maximum	53.4	17.2	14.4	19.2	0.59
			Minimum	48.6	13.8	10.5	15.2	0.47
			Average	51.6	15.8	12.3	16.7	0.5
		November ’22	Maximum	47.6	17.6	13.5	19.1	0.6
			Minimum	42.5	14.6	12.1	15.9	0.52
			Average	44.4	15.7	12.7	17.3	0.6
		December ’22	Maximum	53.3	18.5	14.6	17.2	0.6
			Minimum	48.3	15	13.2	14.1	0.48
			Average	51.5	17.3	13.8	15.7	0.5
		January’23	Maximum	61.8	20.9	16.7	18.7	0.6
			Minimum	57.5	17.4	15.1	15.5	0.5
			Average	59.8	19.6	15.8	17.0	0.5
		February ’23	Maximum	74.5	22.3	16.9	17.8	0.59
			Minimum	66.3	16.4	15.5	15.2	0.51
			Average	70.7	18.8	16.1	16.4	0.6
		March ’23	Maximum	93.8	44.5	21.11	28	0.65
			Minimum	73.8	27.6	17.2	21.7	0.47
			Average	84.1	34.6	19.3	26.0	0.6
		October ’22	Maximum	58.4	17.2	14.8	19.5	0.62
			Minimum	50.8	13.8	10.4	15.8	0.5
			Average	54.1	16.0	12.4	17.3	0.5

Si. No.	Location	Month	Concentration	PIlio µg/m³	PM2.5 lug/m³	SO2 lug/m³	NO2 lug/m³	CO mg/m³
2.	Jaribahal Village	November'22	Maximum	47.9	17.6	13.2	18.8	0.58
			Minimum	42.4	14.2	12.3	15.8	0.49
			Average	45.4	16.0	12.8	17.1	0.5
		December'22	Maximum	53.9	18.6	14.9	17.8	0.59
			Minimum	48.6	16.9	13.4	14.3	0.5
			Average	51.3	17.7	14.2	16.3	0.6
		January'23	Maximum	61	20.3	16.6	18.5	0.6
			Minimum	56.5	17.1	15	15.7	0.5
			Average	58.0	18.5	15.7	17.1	0.6
		February '23	Maximum	74.4	21.7	16.8	18.5	0.61
			Minimum	66.7	17.3	15.2	15.7	0.52
			Average	70.1	19.1	16.1	17.3	0.6
		March '23	Maximum	74.3	31.5	21.2	32	0.61
			Minimum	63.6	18.1	14.5	24	0.46
			Average	69.7	24.8	18.2	27.4	0.6
3.	Bandhabeda Village	October '22	Maximum	59.2	17.2	13.4	17.2	0.57
			Minimum	48.6	13.4	10.4	13.4	0.48
			Average	53.1	15.7	12.1	15.9	0.5
		November'22	Maximum	47.2	17.8	13.7	18.4	0.58
			Minimum	42.3	14.1	12.7	15.1	0.48
			Average	45.1	15.3	13.2	16.6	0.5
		December'22	Maximum	54	18.6	14.7	17.9	0.61
			Minimum	49.9	15.2	13	15.2	0.52
			Average	51.8	16.8	13.7	16.3	0.6
		January'23	Maximum	60.8	20	17	18.8	0.61
			Minimum	56.3	17	15.4	16.2	0.48
			Average	58.7	18.3	16.3	17.6	0.5

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
		February ’23	Maximum	73.8	21.6	17.7	18.4	0.61
			Minimum	66.6	17.9	15.2	16.2	0.48
			Average	69.5	19.3	16.6	17.4	0.5
		March ’23	Maximum	76.3	34.5	19.4	36.4	0.61
			Minimum	59.8	22	13.2	26.2	0.43
			Average	67.3	27.9	16.2	30.2	0.5
4.	Kamalpur Village	October ’22	Maximum	57.5	19.4	12.9	17.5	0.54
			Minimum	51	14.7	10.8	12.7	0.49
			Average	54.3	16.8	11.9	16.2	0.5
		November ’22	Maximum	47.4	17.5	13.9	18.9	0.58
			Minimum	44.3	14.3	12.2	15.5	0.49
			Average	46.0	16.4	13.2	17.3	0.5
		December ’22	Maximum	53.4	18.5	15.0	17.9	0.6
			Minimum	49.1	15.1	13.2	16	0.49
			Average	51.0	16.9	14.2	16.8	0.6
		January’23	Maximum	59.9	20.6	16.7	18.3	0.6
			Minimum	57	17.3	15.1	15	0.51
			Average	58.4	19.4	16.0	17.2	0.5
		February ’23	Maximum	73.8	21.9	16.7	18.7	0.6
			Minimum	67.1	17.4	15.1	16.1	0.52
			Average	70.1	19.3	15.8	17.7	0.6
		March ’23	Maximum	81.3	34.5	19.2	34.2	0.7
			Minimum	68.4	25.5	14.2	26.2	0.43
			Average	73.7	29.1	16.7	29.5	0.6

3. Fugitive Emission Monitoring (µg/m³)

Sl. No.	Month	Screen Plant		Waste Dump		Mines Face Bench	
		21^{O} 58' 7.25"N 85^{O} 23' 12.0"E		21^{O} 57' 56.21"N 85^{O} 23' 3.51"E		21°58'8.65"N 85°22'49.65"E	
1.	October '22	Max	Min	Max	Min	Max	Min
		574.5	396.6	590.8	432.7	568.2	414.1
2.	November'22	549	450.4	549.7	452.3	536.6	450.6
3.	December '22	619.1	521.8	619.8	526.7	619.6	526.1
4.	January'23	659.3	561.2	658	560.2	655.6	560.2
5.	February'23	796.9	637.7	794.4	636.4	782.1	643.6
6.	March '23	921	667	916	658.3	938	667
Six Month Average		686.6	539.1	688.1	544.4	683.4	543.6
Sl. No.	**Month**	**Crusher Plant**		**Ore storage & Loading Point**		**Mines Haulage Road**	
		21^{O} 58' 7.25"N 85^{O} 23' 12.0"E		21^{O} 57' 56.21"N 85^{O} 23' 3.51"E		21°58'8.65"N 85°22'49.65"E	
1.	October'22	Max	Min	Max	Min	Max	Min
		621.5	434.3	570.9	414.5	602.8	397.8
2.	November'22	542.6	450.6	546.9	451.7	543.9	450.5

3.	December'22	615.2	520.3	619.7	529.3	619	522
4.	January'23	642.9	561.2	652.9	564	658.4	562.1
5.	February'23	787.8	611.3	783	635.3	794	619.3
6.	March'23	925	656	936	678	924	673
Six Month Average		689.2	539.0	684.9	545.5	690.4	537.5

4. ILLUMINATION MONITORING (Lux)

	October 22		November 22		December 22	
LOCATION	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
Workshop Area	70	180	96	92	193	116
Screen Plant	28	41	92	76	22	36
Haul Road	52	88	32	27	29	70
Loading Point	48	62	38	50	28	44
Crusher Plant	29	45	30	28	59.3	72.4
Parking Yard	20	24	28	24	29	40
Permanent Path	64	70	104	80	65	76
Electric Substation	52	86	97	36	49	78
Rest Shelter	72	79	45	57	55	80
Mines Bench Foot Path	52	120	65	30	119	200
	January 23		**February 23**		**March 23**	
LOCATION	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
Workshop Area	72	87	138	64	96	116
Screen Plant	68	170	71	87	92	36
Haul Road	46	93	180	51	32	70
Loading Point	18	32	52	57	38	44
Crusher Plant	35	65	67	54	30	72.4
Parking Yard	34	58	58	39	28	40
Permanent Path	72	80	98	103	104	76
Electric Substation	52	87	125	58	97	78
Rest Shelter	52	78	47	57	45	80
Mines Bench Foot Path	44	87	74	104	65	200

5. Noise Level {dB(A)}

A. Ambient Noise Monitoring

Location	October 22		November -22		December -22		Standards	
	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night
EAST BOUNDARY	58.2	47.2	59.6	45.9	57.2	43.7	55 dB(A)	45 dB(A)
WEST BOUNDARY	66.28	57.24	65.56	51.18	67.42	53.25	75 dB(A)	70 dB(A)
NORTH BOUNDARY	59.4	63.4	58.1	64.5	60.2	50.1	75 dB(A)	70 dB(A)
SOUTH BOUNDARY	58.1	56.4	59.2	55.3	61.4	54.2	75 dB(A)	70 dB(A)
GUEST HOUSE AREA	52.36	45.2	53.41	43.17	54.13	41.22	75 dB(A)	70 dB(A)
Location	**January-23**		**February-23**		**March-23**		**Standards**	
	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night
EAST BOUNDARY	57.2	43.7	58.1	44.8	62.9	58.3	55 dB(A)	45 dB(A)
WEST BOUNDARY	67.42	53.25	66.2	54.5	64.5	52.6	75 dB(A)	70 dB(A)
NORTH BOUNDARY	60.2	50.1	61.5	51.8	67.2	53.9	75 dB(A)	70 dB(A)
SOUTH BOUNDARY	61.4	54.2	62.7	53.5	54.8	42.7	75 dB(A)	70 dB(A)
GUEST HOUSE AREA	54.13	41.22	54.3	42.2	53.6	41.8	75 dB(A)	70 dB(A)

B. Source Noise Monitoring

CORE ZONE	October 22				November -22			
	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
	Leq				Leq			
DUMPER	70.26	67.42	70.6	70.6	68.3	71.9	71.7	72.3
LOADER	59.3	70.2	69.24	71.2	71.3	70.9	69.9	70.5
CRUSHER PLANT	68.04	69.34	67.42	71.2	70.3	71	72.6	71.5
SCREEN PLANT	62.8	71.4	71.64	68	70.8	68.2	72.6	68.9
MINES OFFICE	69.07	63.24	69.38	73.2	71.1	69.2	72.9	70.4
EXCAVOTAR	74.2	73.2	74.62	74.6	70.7	72.3	70.9	68.6
DOZER	71.6	72.6	70.45	72.4	69.2	72.2	68.1	72.7

CORE ZONE	December -22				January-23			
	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
	Leq				Leq			
DUMPER	69.4	71.9	71.5	69.5	68.6	70.4	70.9	67.6
LOADER	70.6	70.8	69.4	71.2	69.4	71.6	70.2	68.4
CRUSHER PLANT	72.6	69.6	71.8	68	73.7	72.8	72	72.1
SCREEN PLANT	72.4	72.2	68.9	70.9	73.8	72.4	71.4	71.3
MINES OFFICE	69.7	71.3	70.5	72.8	71.5	70	69.6	70.5
EXCAVOTAR	69	68.6	72.1	69.6	70.3	69.5	68.3	68.8
DOZER	68.2	71.2	69	68.4	72.6	70.2	69.5	69.2
CORE ZONE	**February-23**				**March-23**			
	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
	Leq				Leq			
DUMPER	67.7	71.7	71.8	66.8	69.8	72.3	68.9	72.2
LOADER	68.6	70.1	69.5	67.6	70.6	71.7	71.9	68.3
CRUSHER PLANT	72.3	71.3	71.6	71.5	71.9	70.9	69	72.7
SCREEN PLANT	74.1	71.6	72.3	72.4	70.7	69.5	69.6	71.1
MINES OFFICE	70.4	72.9	70.2	71.1	71.1	69.4	69.3	70.4
EXCAVOTAR	71	70.8	69.1	70.2	70.9	68.1	69.6	71.3
DOZER	71.3	71.6	71.5	70.9	71.4	71.5	72.5	69.9

6. Surface Water Quality

JAJANG IRON ORE MINE								
Baitarini River Upstream								
Parameter	**Units**	**October-22**	**November -22**	**December - 22**	**January -23**	**February-23**	**March-23**	**Limits for Stream Water Standards**
PH	**-**	6.41	6.94	6.87	6.74	6.81	6.25	6.5-8.5
Total Dissolved Solids	**mg/l**	187	188	171	176	184	130	1500
Chlorides	**mg/l**	16	12	14	16	16	12	600
Iron	**mg/l**	0.25	0.12	0.14	0.14	0.15	0.12	50
Fluorides	**mg/l**	0.23	0.22	0.2	0.11	0.11	0.18	1.5
BOD	**mg/l**	6	BDL	BDL	2.1	2.4	2.1	3
DO	**mg/l**	6.2	6.3	6.2	6.9	6.8	6.7	4
Baitarini River Downstream								
Parameter	**Units**	**October-22**	**November -22**	**December - 22**	**January -23**	**February-23**	**March-23**	**Limits for Stream Water Standards**

PH	**-**	7.1	6.83	6.65	6.9	6.74	7.04	6.5-8.5
Total Dissolved Solids	**mg/l**	267	212	178	227	236	175	1500
Chlorides	**mg/l**	28	14	18	18	20	22	600
Iron	**mg/l**	0.23	0.1	0.19	0.12	0.15	0.10	50
Fluorides	**mg/l**	0.21	0.24	0.25	0.19	0.16	0.23	1.5
BOD	**mg/l**	8	2.2	BDL	3.2	3.6	2.2	3
DO	**mg/l**	5.8	6	6	6.2	6.2	5.0	4
Suna River Upstream								
Parameter	**Units**	**October-22**	**November -22**	**December - 22**	**January -23**	**February-23**	**March-23**	**Limits for Stream Water Standards**
PH	**-**	6.93	7.42	6.9	7.35	7.39	7.14	6.5-8.5
Total Dissolved Solids	**mg/l**	177	166	177	156	146	154	1500
Chlorides	**mg/l**	24	20	24	24	26	16	600
Iron	**mg/l**	0.14	0.1	0.14	0.09	0.09	0.12	50
Fluorides	**mg/l**	0.4	0.18	0.4	0.16	0.15	0.20	1.5
BOD	**mg/l**	5.5	5.5	5.5	4.2	4	2.5	3
DO	**mg/l**	6.1	6.4	6.1	6.8	6.7	6.3	4
Suna River Downstream								
Parameter	**Units**	**October-22**	**November -22**	**December - 22**	**January -23**	**February-23**	**March-23**	**Limits for Stream Water Standards**
PH	**-**	7.17	7.19	7.17	7.03	7.12	7.27	6.5-8.5
Total Dissolved Solids	**mg/l**	243	209	243	191	204	207	1500
Chlorides	**mg/l**	28	20	28	30	28	23	600
Iron	**mg/l**	0.19	0.16	0.19	0.13	0.19	0.18	50
Fluorides	**mg/l**	0.41	0.2	0.41	0.19	0.18	0.25	1.5
BOD	**mg/l**	7	9	7	4.9	5.2	3.1	3
DO	**mg/l**	5.6	6.2	5.6	6.5	6.2	5.3	4
Kakarpani River Upstream								
Parameter	**Units**	**October-22**	**November -22**	**December - 22**	**January -23**	**February-23**	**March-23**	**Limits for Stream Water Standards**
PH	**-**	6.81	6.77	6.81	6.7	6.76	6.65	6.5-8.5
Total Dissolved Solids	**mg/l**	169	157	169	169	176	151	1500
Chlorides	**mg/l**	20	25	20	16.9	16	22	600
Iron	**mg/l**	0.22	0.27	0.22	0.2	0.23	0.12	50
Fluorides	**mg/l**	0.35	0.31	0.35	0.28	0.21	0.20	1.5
BOD	**mg/l**	8	5	8	4.3	4	3.0	3
DO	**mg/l**	6.3	6.1	6.3	6.4	6.5	5.5	4
Kakarpani River Downstream								

Parameter	Units	October-22	November -22	December - 22	January -23	February-23	March-23	Limits for Stream Water Standards
PH	-	6.91	6.92	6.91	6.89	6.92	6.48	6.5-8.5
Total Dissolved Solids	mg/l	214	197	6.91	215	228	156	1500
Chlorides	mg/l	26	30	26	34	30	23	600
Iron	mg/l	0.21	0.25	0.21	0.22	0.26	0.16	50
Fluorides	mg/l	0.32	0.32	0.32	0.29	0.28	0.20	1.5
BOD	mg/l	12	7	12	6.4	6.8	3.2	3
DO	mg/l	6.1	6	6.1	6.2	6	6.2	4
Jalpa River Upstream								
Parameter	Units	October-22	November -22	December - 22	January -23	February-23	March-23	Limits for Stream Water Standards
PH	-	6.82	6.87	6.82	6.94	6.86	6.5	6.5-8.5
Total Dissolved Solids	mg/l	210	188	210	176	184	159	1500
Chlorides	mg/l	19.3	14	19.3	16	16	13	600
Iron	mg/l	0.08	0.11	0.08	0.16	0.15	0.16	50
Fluorides	mg/l	0.21	0.26	0.21	0.32	0.34	0.24	1.5
BOD	mg/l	9	6	9	4.3	4.6	3.1	3
DO	mg/l	5.4	5.2	5.4	5.6	5.4	5.4	4
Jalpa River Downstream								
Parameter	Units	October-22	November -22	December - 22	January -23	February-23	March-23	Limits for Stream Water Standards
PH	-	7.2	7.03	7.2	7.2	7.08	7.30	6.5-8.5
Total Dissolved Solids	mg/l	244	239	244	245	264	160	1500
Chlorides	mg/l	26	34	26	28	24	23	600
Iron	mg/l	0.14	0.12	0.14	0.18	0.23	0.12	50
Fluorides	mg/l	0.23	0.21	0.23	0.23	0.25	0.24	1.5
BOD	mg/l	11	9	11	7.5	8.6	2.8	3
DO	mg/l	5.1	5.3	5.1	5.7	5.4	5.2	4

7. Surface Water Flow Rate

LOCATION NAME	October-22	November -22	December - 22	January-23	February-23	March-23
Baitarani River	1.46	0.59	0.4	0.61	0.31	0.32
Kakarpani River	1.52	0.4	0.57	0.58	0.28	0.30
Sona River	1.06	0.5	0.47	0.59	0.27	0.29
Jalpa River	0.59	0.49	0.39	0.67	0.3	0.54

8. Ground Water Quality

Sl. No.	TESTS	Units	November-2022					
			Dug well Near Bil Siding	Kamalpur Village	Jajang Village	Jurudi Village	Jalahari Village	Tap Water Near Jajang Mine
1.	pH	-	6.79	6.98	6.77	6.96	6.78	6.73
2.	Total Dissolved Solids as TDS	mg/l	72	56	88	76	68	52.6
3.	Total Hardness as CaCO3	mg/l	0.2	0.2	0.09	0.12	0.16	0.12
4.	Chloride as Cl	mg/l	18	18	10	18	18	14
5.	Fluorides as F	mg/l	116	144	180	163	123	114
6.	Iron as Fe	mg/l	21.6	13.4	18.6	13.5	15.2	1.5
Sl. No.	TESTS	Units	January-2023					
			Dugwell Near Bil Siding	Kamalpur Village	Jajang Village	Jurudi Village	Jalahari Village	Tap Water Near Jajang Mine
1.	pH	-	6.65	6.88	6.67	6.95	6.88	6.93
2.	Total Dissolved Solids as TDS	mg/l	120	136	159	161.0	128.0	121.0
3.	Total Hardness as CaCO3	mg/l	71.0	52.0	89	71	69.0	48.0
4.	Chloride as Cl	mg/l	17.0	16.0	12	17.0	17.0	15.0
5.	Fluorides as F	mg/l	0.29	0.28	0.24	0.23	0.25	0.32
6.	Iron as Fe	mg/l	0.21	0.21	0.08	0.15	0.12	0.15

9. Drinking Water Quality

Parameter	Units	October -22	November -22	December - 22	January-23	February-23	March-23	Acceptable Limits	Permissible Limits
PH	-	6.81	6.89	6.85	6.83	6.78	6.79	6.5-8.5	No Relaxation
Total Hardness	mg/l	68	60	68	52	54	60	200	600
Iron	mg/l	0.21	0.2	0.25	0.18	0.62	0.12	1	No Relaxation
Chlorides	mg/l	10	16	12	12	12	18	250	1000
Total Dissolved Solids	mg/l	152	163	154	174	170	116	500	2000
Sulphates	mg/l	14.2	17.7	13.4	14.2	13.9	16.55	200	400
Fluoride	mg/l	0.26	0.29	0.34	0.32	0.31	0.25	1	1.5

10. ETP

TESTS	Unit	October-22	November - 22	Decemb er - 22	January -23	February-23	March-23	Detection Range
ETP INLET								
Ph	-	6.28	6.33	6.45	6.46	6.52	7.32	2.0 -12
Total Suspended Solids as TSS	mg/l	64.9	57.4	59.2	49.3	54.6	27.6	5 – 5000
Total Dissolved Solids as TDS	mg/l	691	713	744	776	792	978	10-10000
Biochemical Oxygen Demand as BOD 3Days at 270C	mg/l	36	33	37	38	42	10	5-10000
Chemical Oxygen Demand as COD	mg/l	254	264	278	278	288	72	5-50000
Oil & Grease	mg/l	6	6.1	8.2	6.4	7.2	5.3	5-600
TESTS	Unit	October-22	November -22	Decembe r - 22	January- 23	February-23	March-23	Detection Range
ETP OUTLET								
pH	-	7.03	7.11	7.23	7.16	7.31	6.9	2.0 -12
Total Suspended Solids as TSS	mg/l	23.1	29.6	32.9	34.3	38	86.6	5 - 5000
Total Dissolved Solids as TDS	mg/l	592	570	598	580	568	1001	10-10000
Biochemical Oxygen Demand as BOD 3Days at 270C	mg/l	18	16	18	14	12.4	26	5-10000
Chemical Oxygen Demand as COD	mg/l	120	128	136	136	128	206	5-50000
Oil & Grease	mg/l	BDL	BDL	BDL	BDL	BDL	7.2	5-600

11. Vibration Monitoring

Sl no.	Station Name	Instrument location	Season (Summer/Winter/Monsoon/post monsoon	Peak particle velocity	Air Over pressure	Frequency	Remark
1	Block – Bzone - 1	Zone-1 area	Autumn	13.19mm/s	98.8dbl@11.1Hz/.0017kpa	11.6	Permisible Limit
2	Block-CRL-640	WASTE DUMP AREA	Autumn	11.37mm/s	95.9dbl@128Hz/.0012kpa	56.9Hz	Permisible Limit
3	B-Block RL-530	ZONE-2 Area	Autumn	5.61mm/s	131.6dbl@4.4Hz/.076kpa	5.7Hz	Permisible Limit
4	B-Block RL-560 Zone-1	Rest Shelter near Z-1	winter	6.82mm/s	129dbl@6.6Hz/.0622kpa	13.8Hz	Permisible Limit
5	B-Block RL-640 Z-1	Hatipit area RL-640	winter	1.62mm/s	147.1dbl@28.4Hz/.4503kpa	12.5Hz	Permisible Limit

Verified By
Technical Manager

----End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
Second Floor Hall, House No. B-1[illegible],
Sector-H, Aliganj, Lucknow-226024

11. Soil Monitoring

Sl. No.	Parameters	Unit	Workshoparea	BandhabedaVillage Agriculture Land	Near GateNo.-2 Back Filling Area-2	Orchard Area
1.	pH	-	6.85	5.29	5.12	5.34
2.	Electrical Conductivity	µmhos/cm	59.2	79.8	56	62
3.	Total Soluble Solid	mg/kg	109	152	98	141
4.	Nitrogen (N)	mg/kg	154	276	180.5	218
5.	Av. Phosphorous (P_2O_5)	kg/ha	23.5	45.2	19.8	42.1
6.	Av. Potassium (K_2O)	mg/kg	301	119	182	324
7.	Av. Sodium (Na_2O)	mg/kg	180	191	132	166
8.	Av. Calcium as Ca	mg/kg	604	1120	1204	904
9.	Av .Magnesium as Mg	mg/kg	114	248	404	204
10.	Chloride (Cl)	mg/kg	40	68	60	60.06
11.	Copper (Cu)	mg/kg	0.26	0.83	0.73	0.16
12.	Zinc (Zn)	mg/kg	2.21	0.29	0.14	0.27
13.	Iron (Fe)	mg/kg	4.84	20.51	4.08	9.47
14.	Manganese (Mn)	mg/kg	7.52	14.05	5.36	9.22
15.	Organic Carbon	%	0.11	0.43	0.09	0.23
16.	Sodium Absorption ratio (SAR)	-	0.66	0.49	0.31	0.47
a	Textural Class	-	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
b	Sand	%	60	51	46	56
c	Silt	%	24	29	34	34
d	Clay	%	16	20	20	10

Verified By
Technical Manager

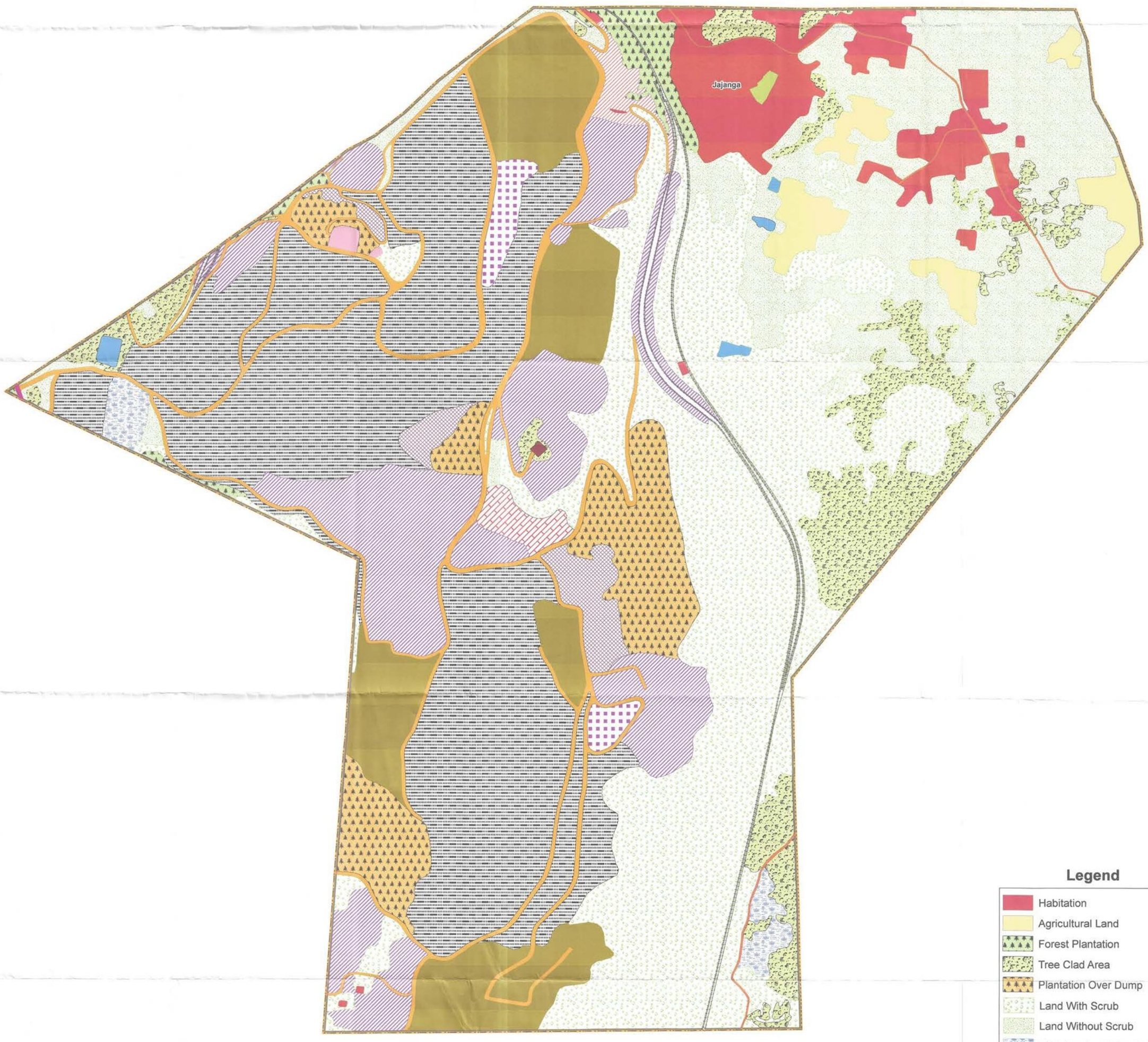
----End of Report----

Authorized By
Quality Manager
Ecomen Laboratories Pvt. Ltd.
Second Floor Hall, House No. B-168,
Sector-H, Aliganj, Lucknow-226024

LANDUSE / LANDCOVER MAP OF JAJANGA IRON ORE MINE IN KEONJHAR DISTRICT OF M/S JSW STEEL LTD.

0 0.375 0.75 1.5 Kilometers

SCALE - 1:5,000



Legend

- Habitation
- Agricultural Land
- Forest Plantation
- Tree Clad Area
- Plantation Over Dump
- Land With Scrub
- Land Without Scrub
- Waterlogging / Marshy / Swampy
- Tank / Pond
- Mining Quarry
- Sub - Grade Dump
- OB Dump
- Stock Yard / Ore Stack
- Back Filling
- Site Services
- Workshop
- Processing Yard

ANNEXURE III

JSW Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

No. JSW/S/O/2022/786

Date: 04/11/2022

To,
The Member Secretary
State Pollution Control Board, Odisha,
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit-8,
BHUBANESWAR- 751012

Sub: - Submission of report for the recommendations of carrying capacity study made by CSIR-NEERI, for environmentally sustainable iron and manganese ore mining activity for **Jajang Iron Ore Mine of M/s JSW Steel Ltd.**

Ref: - 1. Your letter No. 13055/ Ind. I-Con-(Misc) 1533 dated 27.07.2022
2. New Consent Order No 2942 vide letter no 4232/IND-I-CON-247 dated 17.03.2022.
3. Our letter no. JSW/S/O/2022/365 date 31.05.2022

Dear Sir,

With reference to aforesaid subject, please find enclosed herewith the 9 Points NEERI Compliance Status Report and carrying capacity study made by CSIR-NEERI, for environmentally sustainable iron and manganese ore mining activity of FY 2021-22 for **Jajang Iron Ore Mine of M/s JSW Steel Ltd**.

Seeking your co-operation as always.

Thanking you,

Yours Faithfully
For JSW Steel Ltd

Mrutyunjaya Mahapatra

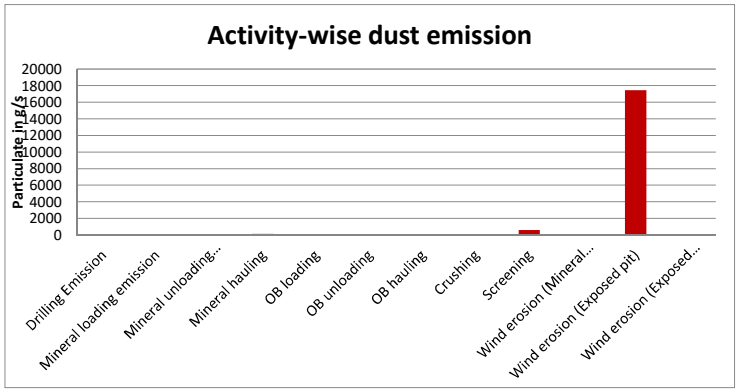
Mrutyunjaya Mahapatra
(Authorized Signatory)

Encl: As above

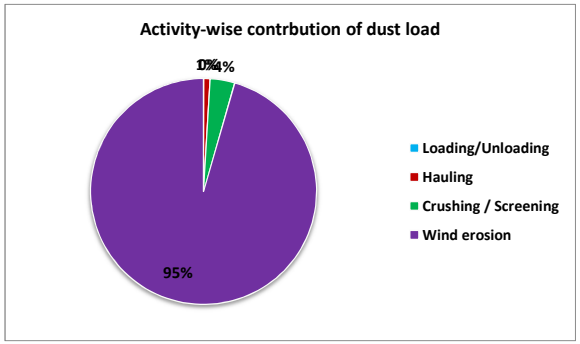
Copy to- The Regional Officer, Regional Office, State Pollution Control Board, Keonjhar, At – Baniapat, College Road, Keonjhar-758 001, Office of the State Pollution Control Board, Odisha

RESULTS OF DUST LOAD CALCULATIONS

	Particulate matter in (g/s)	Particulate matter in (kg/d)	Particulate matter (kg per ton of ore)
Drilling Emission	0.04990632	4.311905677	0.000137343
Mineral loading emission	0.41704926	36.03305591	0.001147723
Mineral unloading emission	0.27205595	23.50563417	0.0007487
Mineral hauling	92.3915719	7982.631815	0.254262301
OB loading	5.20916808	450.0721219	0.01433567
OB unloading	0.73650148	63.63372756	0.002026858
OB hauling	69.2936789	5986.973861	0.190696726
Crushing	66.6666667	5760	0.183467168
Screening	583.333333	50400	1.605337722
Wind erosion (Mineral stack)	28.2017675	2436.632716	0.077611476
Wind erosion (Exposed pit)	17446.9059	1507412.671	48.01401636
Wind erosion (Exposed OB dump)	13.8585188	1197.376028	0.038138748
Total	**18307.34**	**1581753.8**	**50.381927**



Major Activity	Dust load (kg/day)
Loading/Unloading	573.24454
Hauling	13969.6057
Crushing / Screening	56160
Wind erosion	1511046.68



GO TO MAIN PAGE

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Annual Environmental Sustainability Report (ESR) for Jajang Iron Ore Mine of M/s JSW Steel Ltd.

Introduction-

The Jajang iron ore mine (erstwhile lessee M/s Rungta Mines Limited) was one of the mines whose lease expired on 31.03.2020. The lease area is located in villages Jajang, Joribahal, Palsa (Ka), Bandhuabeda, Tehsil Barbil, District Keonjhar, Odisha state.

Government of Odisha vide letter No. 3007/S&M/Bhubaneshwar/IV(Misc)SM-66/2016 dated 18th March 2020 issued the notice for grant of Mining Lease (ML) for Jajang Iron Ore Block over an area of 666.15 ha as per ROR (669.078 ha as per DGPS computation) in villages Jajang, Jadibahal, Palsa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar district, Odisha for a mineable reserve size of about 34.87 Million tonnes (Mt).

In pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated 6th December, 2019 for commencement of the auction process to grant the mining lease in respect of Jajang Iron Ore Block located in villages Jajang, Joribahal, Palsa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar district, Odisha. The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for the said mineral block and M/s JSW Steel Limited was declared as the Preferred Bidder under Rule 9(9) (iii) of Mineral (Auction) Rules, 2015.

Without prejudice to the generality of the provisions of section 8B(2) of the MMDR Act, 1957, the details of the valid rights, approvals, clearances, licenses, and the like held by the previous lessee are vested in favor of M/s JSW Steel Ltd by the Govt. of Odisha for a period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearances, licenses, permits, and the like, whichever is earlier vide order No-4190/SM, dated 29.05.2020. M/s JSW Steel Limited being successful bidder upon execution of mining lease deed, the Successful Bidder shall immediately, but not later than one hundred twenty days from the date of execution of mining lease, apply afresh for all necessary rights, approvals, clearances, licenses and the like under the applicable statutes, rules or regulations, as the case may be, for obtaining the necessary clearances to enable further continuance of the mining operations beyond two years and vesting order shall be valid for a period of two years from the date of execution of new lease deed or till the date of getting all fresh approvals, clearances, licenses, permits, and the like, whichever is earlier."

Subsequent to signing of the **MDPA, M/s JSW Steel Limited** has made payment of the third instalment being the eighty percent of the upfront value and executed and registered the mining lease with the Government of Odisha on 27.06.2020 and the mining lease was granted in favor of M/s JSW Steel Limited for a period of 50 years w.e.f 27.06.2020.

Indicative Coordinates Range of the Jajang Iron Ore Mine

Pillar No.	Latitude	Longitude
1	21°54'44.23926" N	85°26'14.55590" E
23	21°56'33.49374" N	85°25'45.85255" E
31	21°55'52.37093" N	85°24'49.65672" E
12	21°56'08.11524" N	85°26'50.70226" E

Fully mechanized open cast method of mining by drilling and blasting and by deploying HEMM equipment's like hydraulic drills and excavators, wheel loaders, dumpers, will be undertaken. The height and width of the benches for iron ore will be kept at 9 m and 15 m respectively. The working of benches will be commenced from top and extended to bottom benches. The excavated ROM ore is proposed to be processed in the crushing and screening plants to obtain the lump and fine ore as product mix. The iron ore lumps and iron ore fines extracted from the mine will be transported through railway/port/road to JSW Steel Plants. There are two nos of railway siding namely, RMJC-JSW Railway Siding and part of BIL Siding existing within the ML area. These sidings is being used for transportation of ore of Jajang block.

Production in FY 2020-21

Jajang mining operations started from 01.07.2020 based on the vested approvals. From July 2020 to March 2021, Jajang Mine has produced 7,194,569 Mt Iron Ore (ROM) and dispatched to steel plants.

Production in FY 2021-22

From April 2021 to March 2022, Jajang Mine has produced 11459271 MT Iron Ore (ROM) and dispatched to Steel Plants.

Environment Management in Jajang Mine

Air Management-

Blasting Operation

- Controlled blasting method is in practice by restriction of explosive charge in the holes.
- Well-designed blast by effective stemming and use of mili second delay detonators, Proper blasting designing to see that the optimum breakage occurs.
- To control ground vibrations and arrest fly rocks, advanced initiation system is being used for blasting
- Ground vibrations are also being monitored and the results are well within limits.

Excavation, Hauling and Crushing & Screening

- Dry fog system for crusher & screen plants are provided.
- Proper maintenance of HEMM
- Using sharp teeth for shovels and other soil excavation equipment, and their periodical replacements.
- Acoustic enclosures for operator cabin.
- Avoiding overloading of dumpers
- Provision of dust filters / masks to workers working at highly dust prone and affected areas
- Imparting sufficient training to operators on safety and Environmental parameters.

Transportation

- Regular water sprinkling is being carried out by engaging 4 mobile water tankers (2x25KL, and 2x16 KL) on the mine benches, mine haul, loading and unloading points and transfer points for dust suppressions. In addition to this, 4 mobile water tankers (4x12KL) being used on the mineral transportation roads for dust suppressions outside the mine area.
- Maintenance of haul road by regular grading is carried out through grader, dozer.
- Ensuring that all mineral trucks are covered by tarpaulin.
- Vehicular emissions controlled through regular and proper preventive maintenance schedules.
- It is ensured that there is no overloading of trucks by having Quick Dispatch system at the weigh bridge near the dispatch gate.
- Regular water sprinkling arrangements have been made on the transportation roads/public road through mobile water tankers.
- Tarpaulin Covering in Railway Wagons.

Wet Drilling And Dust Extractor System In Drilling Operation

Quick Dispatch System

Water Tanker arrangement For Haul Road Dust Suppression

Dry Fog System in Mineral Handling Plants

Tarpaulin Covering on the Railway Wagons

CAAQMS 1. Jajang_Mines Office_AAQMS_01
CAAQMS 2. Jajang_New_Workshop_AAQMS_02
CAAQMS 3. Jajang_Gate No-6_AAQMS_03
CAAQMS 4. Jajang_Guest_House_AAQMS_04

CAAQMS at Guest House Area Jajang

Electronic Digital Display Board near Jajang Mine Gate No 6

Consolidated Air Quality Monitoring Data of FY 2021-2022

JAJANG IRON ORE MINES										
AAQ DATA FOR THE PERIOD APRIL 2021 TO MARCH 2022										
	PM10 [µg/m3]		PM2.5 [µg/m3]		SO2 [µg/m3]		NO2 [µg/m3]		CO [mg/m3]	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
CORE ZONE										
Mines Office	78	33	30	11	12.9	8.2	14.4	9.5	0.77	0.35
Entry & Exit Gate	94	32	35	11	13.5	9	15	10.3	0.83	0.41
Residential Colony	63	29	23	10	10.6	7.1	11.9	8.4	0.56	0.19
Work Shop Area	79	33	29	11	11.7	7.9	13.2	9.2	0.71	0.27
BUFFER ZONE										
Jajang Village	74	38	28	13	12	9.2	13.4	10.6	0.72	0.39
Jaraibahal Village	75	42	28	14	12.5	9.9	13.9	11.2	0.77	0.46
Banda	70	39	26	13	11.5	9	12.9	10.6	0.69	0.37

beda Village										
Kamalpur Village	63	29	22	10	10.1	6.3	11.7	7.6	0.49	0.21
NAAQ (24 hr standard)	**100 [µg/m3]**		**60 [µg/m3]**		**80 [µg/m3]**		**80 [µg/m3]**		**2 [mg/m3] (8 hourly)**	

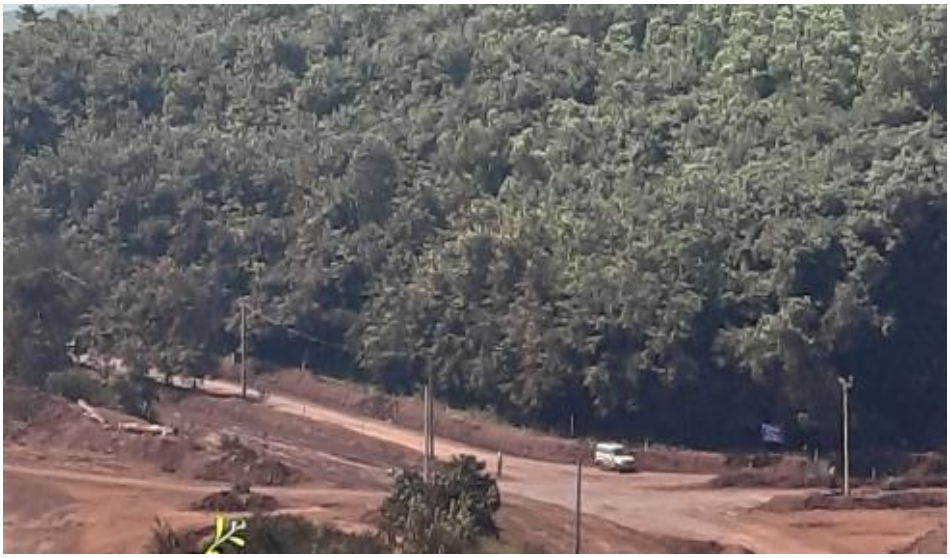
Water & OB Management

- Garland drains maintained of suitable size around mine area and dump with proper gradients to prevent rain water descent into active mine area.
- Settling ponds maintained to prevent flow of fine particles from OB / Waste dumps, check dams, parapet / retaining walls & garland drains.
- Usage of stored water in the settling ponds for watering of haul roads, vehicle washing and green belt development etc.
- De- silting of garland drains & settling ponds are being carried out at regular intervals.
- Maintenance of all the runoff management structures.

Retaining Wall, GeoCoir Matting & Plantation on Backfilled Area 2

Check Dam near railway siding

Revamped Existing Wheel Washing System near Gate No 6.



Plantation on OB Dump no 2

Plantation in Safety Zone near Gate No 2

Plantation in Safety Zone and Road Side Plantation

Orchard in Jajang Mine

Hazardous Waste Storage Area in Jajang Mine Workshop

Hazardous Waste Unit at Workshop Area

Consolidated Ground Water Quality Monitoring Data of FY 2021-2022

JAJANG IRON ORE MINES						
Kamalpur Village (Borewell)						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.81	6.67	6.7	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	80	68	74.5	**200**	**600**
Iron	mg/l	0.12	0.07	0.1	**1**	**No Relaxation**
Chlorides	mg/l	59	50	54.3	**250**	**1000**
Total Dissolved Solids	mg/l	225	208	217.8	**500**	**2000**
Sulphates	mg/l	35	26	30.8	**200**	**400**
Fluoride	mg/l	0.43	0.4	0.4	**1**	**1.5**
Jajang Village (Borewell)						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.94	6.81	6.86	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	97	86	91.75	**200**	**600**
Iron	mg/l	0.15	0.07	0.11	**1**	**No Relaxation**

Chlorides	mg/l	64	56	59.50	**250**	**1000**
Total Dissolved Solids	mg/l	256	220	242.00	**500**	**2000**
Sulphates	mg/l	36	29	33.75	**200**	**400**
Fluoride	mg/l	0.38	0.35	0.37	**1**	**1.5**
Jurudi Village (Dug well)						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.88	6.8	6.84	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	87	70	79.75	**200**	**600**
Iron	mg/l	0.1	0.07	0.085	**1**	**No Relaxation**
Chlorides	mg/l	56	45	49.75	**250**	**1000**
Total Dissolved Solids	mg/l	220	206	214	**500**	**2000**
Sulphates	mg/l	35	26	30	**200**	**400**
Fluoride	mg/l	0.44	0.32	0.4025	**1**	**1.5**
Jalahari Village (Bore well)						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.69	6.62	6.6575	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	57	50	53	**200**	**600**
Iron	mg/l	0.1	0.07	0.085	**1**	**No Relaxation**
Chlorides	mg/l	48	42	45.75	**250**	**1000**
Total Dissolved Solids	mg/l	215	198	207.5	**500**	**2000**
Sulphates	mg/l	25	16	20.5	**200**	**400**
Fluoride	mg/l	0.45	0.36	0.415	**1**	**1.5**
Tap water near Jajang village						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.8	6.74	6.7625	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	62	50	55.5	**200**	**600**
Iron	mg/l	0.1	0.08	0.0925	**1**	**No Relaxation**

Chlorides	mg/l	50	38	43.75	**250**	**1000**
Total Dissolved Solids	mg/l	230	172	199.5	**500**	**2000**
Sulphates	mg/l	35	25	30.25	**200**	**400**
Fluoride	mg/l	0.47	0.39	0.4225	**1**	**1.5**
Dugwell Near BIL Siding						
Parameter	**Units**	**Max.**	**Min**	**Avg.**	**Acceptable Limits**	**Permissible Limits**
PH	-	6.81	6.7	6.745	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	68	52	58.25	**200**	**600**
Iron	mg/l	0.08	0.07	0.075	**1**	**No Relaxation**
Chlorides	mg/l	49	42	45.25	**250**	**1000**
Total Dissolved Solids	mg/l	225	196	216	**500**	**2000**
Sulphates	mg/l	28	19	24.5	**200**	**400**
Fluoride	mg/l	0.42	0.26	0.36	**1**	**1.5**

Consolidated Surface Water Quality Monitoring Data of FY 2021-2022

JAJANG IRON ORE MINES				
Baitarini River UpStream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	6.82	6.58	**6.5-8.5**
Total Dissolved Solids	mg/l	172	86	**1500**
Chlorides	mg/l	25	7	**600**
Iron	mg/l	0.36	0.13	**50**
Fluorides	mg/l	0.2	0.1	**1.5**
BOD	mg/l	8	2	**3**
DO	mg/l	5.6	5.1	**4**

Baitarini River DownStream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	6.92	6.73	**6.5-8.5**
Total Dissolved Solids	mg/l	196	102	**1500**
Chlorides	mg/l	35	10	**600**
Iron	mg/l	0.65	0.19	**50**
Fluorides	mg/l	0.26	0.15	**1.5**
BOD	mg/l	9	4	**3**
DO	mg/l	6.8	4.5	**4**
Suna River Upstream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	6.97	6.73	**6.5-8.5**
Total Dissolved Solids	mg/l	154	94	**1500**
Chlorides	mg/l	10	7	**600**
Iron	mg/l	0.24	0.1	**50**
Fluorides	mg/l	0.34	0.12	**1.5**
BOD	mg/l	3	2	**3**
DO	mg/l	5.6	5.1	**4**
Suna River Downstream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	6.8	6.69	**6.5-8.5**
Total Dissolved Solids	mg/l	192	160	**1500**

Chlorides	mg/l	40	12	**600**
Iron	mg/l	0.21	0.15	**50**
Fluorides	mg/l	0.25	0.19	**1.5**
BOD	mg/l	6	3	**3**
DO	mg/l	5.4	4.5	**4**
Jalpa Nadi Upstream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	6.8	6.56	**6.5-8.5**
Total Dissolved Solids	mg/l	164	125	**1500**
Chlorides	mg/l	25	10	**600**
Iron	mg/l	0.23	0.17	**50**
Fluorides	mg/l	0.16	0.12	**1.5**
BOD	mg/l	6	3	**3**
DO	mg/l	5.5	5.1	**4**
Jalpa River Downstream				
Parameter	**Units**	**Maximum**	**Minimum**	**Limits for Stream Water Standards**
PH	-	7.1	6.82	**6.5-8.5**
Total Dissolved Solids	mg/l	192	145	**1500**
Chlorides	mg/l	30	15	**600**
Iron	mg/l	0.24	0.2	**50**
Fluorides	mg/l	0.2	0.16	**1.5**
BOD	mg/l	6	5	**3**
DO	mg/l	5.3	5	**4**

Noise Management

- Providing sound proof operator's cabin for equipment like dumpers, shovel, tippers, etc.
- Planting trees at various places within the lease area to act as acoustic barriers.
- Proper and regular maintenance of vehicles, machinery and other equipment. All HEMMs are monitored for any abnormal sound and rectified with due precaution by maintenance personnel.
- Providing workers with ear muffs & earplugs against high noise levels.
- Conducting regular health check-ups of workers including Audiometry test
- Controlling the time of exposure of workers towards high noise areas.

Jajang Iron Ore Mines			
CORE ZONE	**max**	**min**	**Standards**
Crusher Plant Area	**81.3**	**77.3**	**85 dB(A)**
Screen Plant Area	**79.9**	**75.7**	
Excavator Operator Cabin	**81.9**	**78.1**	
Dozer Operator Cabin	**82**	**79.2**	
Dumper Operator Cabin	**80.2**	**76.7**	
Loader Operator Cabin	**82.3**	**78.8**	
Mines Office Area	**63.5**	**50.6**	

BUFFER ZONE					**STANDARDS**	
	Leq Day		Leq Night		**Day Equivalent**	**Night Equivalent**
	MAX	**MIN**	**MAX**	**MIN**	55 dB(A)	45 dB(A)
GUEST HOUSE AREA	52.8	48.6	42.9	37.2		
EAST BOUNDARY	68.8	66.6	60.8	54.3		
WEST BOUNDARY	68.6	61.2	56.9	55.4		
NORTH BOUNDARY	67.1	63.9	57.5	54.8		
SOUTH BOUNDARY	69.7	60.6	60.2	53.1		

Jajang Environmental Protection Measures Expenditure (head wise breakup) incurred from in FY July 2020-YTD

Particulars	**Approximately Cost incurred (in Crores)**
Dust Suppression (Wet Drilling, Dry Fog System, Mobile Haul road water sprinkling system, etc.)	0.25
Fixed Water Sprinkling Project	0.20
Online Environmental Monitoring System (CAAQMS & Digital Display Board)	1.50
Manual Environment Monitoring	0.15
ETP/Mechanized Oil Grease Trap System	0.10
Water Sprinkling on National Highway/nearby village/transportation roads	0.20
OB Dump & Surface Run-off Management	0.05
Environment Awareness in MEMC Week 2020-21	0.05
Grand Total (Rs. in Cr.)	**2.50**

ANNEXURE IV

जल शक्ति मंत्रालय
जल संसाधन, नदी विकास
और गंगा संरक्षण विभाग
केन्द्रीय भूमि जल प्राधिकरण
Government of India
Ministry of Jal Shakti
Department of Water Resources,
River Development & Ganga Rejuvenation
Central Ground Water Authority

(भूजल निकासी हेतु अनापत्ति प्रमाण पत्र)

NO OBJECTION CERTIFICATE (NOC) FOR GROUND WATER ABSTRACTION

Project Name:	M/s Rungta Mines Limited		
Project Address:	M/s Rungta Mines Limited, Jajang Iron and Manganese Mine		
Village:	Palasa (Kha)	Block:	Joda
District:	Kendujhar	State:	Odisha
Pin Code:	758035		
Communication Address:	Director, Jajang Iron and Mnganese Mine, Rungta Office , Main Road, AT/ PO- Barbil Joda, Kendujhar, Odisha - 758035		
Address of CGWB Regional Office:	Central Ground Water Board South Eastern Region, Bhujal Bhawan, Khandagiri Square, NH-5, Bhubaneshwar, Odisha - 750001		

1	NOC No.:	CGWA/NOC/MIN/REN/2/2020/5639	3.	Category:	Mining
2	Application No.:	21-4/203/OR/MIN/2009	5.	NOC Type:	2nd Renewal
4.	Project Status:	Existing Project	7.	Valid up to:	08/12/2023
6.	Valid from:	10/12/2018			

8. Ground Water Abstraction Permitted

Fresh Water		Saline Water		Dewatering		Total	
m³/day	m³/year	m³/day	m³/year	m³/day	m³/year	m³/day	m³/year
1000.00	365000.00					1000.00	365000.00

9. Details of ground water abstraction /Dewatering structures

	Total Existing No.:7					Total Proposed No.:2				
	DW	DCB	BW	TW	MP	DW	DCB	BW	TW	MP
Abstraction Structure*	0	0	7	0	0	0	0	2	0	0

*DW- Dug Well, DCB-Dug-cum-Bore Well, BW-Bore Well, TW-Tube Well, MP-Mine Pit

10. Quantum of ground water recharge/harvesting(m³/year): 598750.00

11. Number of Piezometers (Observation wells) to be constructed/ monitored & Monitoring mechanism

No. of Piezometers	Monitoring Mechanism		
	Manual	DWLR**	DWLR With Telemetry
2	0	1	1

**DWLR - Digital Water Level Recorder

(Compliance Conditions given overleaf)

Digitally signed by
NANDAKUMARAN P
Date: 2020.02.05 15:30:55 +05'30'

सदस्य (केन्द्रीय भूमि जल प्राधिकरण)
Member (CGWA)

ANNEXURE V

Site Specific Wildlife Conservation Plan for Jajang Iron Ore Mine of M/s JSW Steel Ltd. in Barbil Tehsil of District Keonjhar, Odisha.

In compliance to the letter no. F.No. J-11015/57/2020-IA.II(M) dated – 05/02/2021 by the Impact assessment Division of Ministry Of Environment, Forest &Climate Change, Government of India, under the standard TOR for production of 12.8 million TPA (ROM) of Iron Ore with maximum waste of 28.589 MTPA (OB/IB/SB) along with screening, crushing of mining project stated in condition No. 16 & 18

Prepared by
Divisional Forest Officer
Keonjhar Forest Division, Keonjhar

PREFACE

Keonjhar district of Odisha is considered to be one of the richest in terms of Forest resources, Biodiversity and minerals. Iron ore deposit in Odisha has heralded the industrial revolution which is the foundation and the raw material for industrial development since 1904. The iron ore demand is increasing at a greater pace. In 2016-17, India's iron ore production level was above 212.64 million tonnes which in terms of global iron ore output was 9.13 percent.

Human activities pose the greatest threat to wildlife because increasing human population results in expanding need of mankind. Wildlife is one of the most gracious gifts of nature to this land, which is as rich in its variety and colours as its numbers. Wildlife management is an ancient phenomenon. Vedas contains hymns in praise of animals with the specific God or Goddess as the best way of conservation of wildlife.

Jajang Iron Ore Mining lease was granted in favor of M/s JSW Steel Limited for period of 50 years through e-auction process for winning iron-ore for non-captive purpose of steel manufacturing. In pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated December 6, 2019 for commencement of the auction process to grant the mining lease in respect of Jajang Iron Ore Block over an area of 669.078 ha. as per DGPS (666.15 ha. as per ROR) for a resource size of about 34.87 Million tones (Mt). The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for the said mineral block and M/s JSW Steel Limited was declared as the preferred bidder under Rule 9(9)(iii) of Mineral (Auction) Rules 2015.

Without rejudice to the generality of the provisions under section 8B (2) of the MMDR Act, 1957, the details of the valid rights , approvals, clearance licenses, and the alike held by the previous lessees are vested in favor of M/s JSW Steel Ltd. by the Govt. of Odisha for a period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearance , licenses, permits and the like, whichever is earlier vide order No.-4190/SM, dated 29.05.2020**.**

M/s JSW steel Limited being successful bidder upon execution of mining lease deed, or the successful Bidder shall immediately, but not later than one hundred twenty days from the date of execution of mining lease, apply afresh for all necessary rights, approvals, clearances licenses and like under the applicable statutes, rule and regulation, as the case may be, for obtaining the necessary clearance to enable further continuance of the mining operations beyond two years and vesting order shall be valid for a period of two years from the date of execution of new lease deed or till the date of getting all fresh approvals, clearance, licenses, permits, and the like whichever is earlier."

Subsequent to signing of the MDPA, M/s JSW Steel Limited has made payment of the third installment being the eighty percent of the upfront value and executed and registered the mining lease with the Government of Odisha on 27.06.2020 and the mining lease was granted in favor of M/s JSW Steel Limited for a period of 50 years w.e.f 27.06.2020.

Ministry of Environment, Forest & climate change (Impact Assessment Division) 'Govt. of India vide F.No. J-11015/57/2020-IA. II (M) dated 05.02.2021 issued TOR (Terms of reference) under EIA notification 2006 for EIA study to issue Environmental Clearance for the above project.

In para 16 &18 of Standard Terms of Reference (TOR) for mining Project MOEF has stipulated as under.

Para 16-A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted".

Para 18- "A detailed biological study area [core zone and buffer zone (10 km radius of the periphery of the mine lease) shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with state forest and wild life Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

As per MOEF notification, it is mandatory to obtain environmental clearance for expansion and modernization of existing projects or activities. JSW proposes to increase the production in this lease area from 12.8 MTPA (ROM) of Iron Ore with maximum waste of 28.589MTPA JOB/B/SB) with screening, crushing.

Therefore in pursuance to the above letter of MOEF & C.C and TOR stipulated there in, this site specific wild life management plan/conservation plan is prepared basing on the TOR in para 16 and 18 of standard TOR for mining project.

As per stipulation detail Biological study containing flora, fauna, endangered, endemic and RET species and impact mining project and detailed mitigative measures are being narrated in the foregoing chapters both for core and buffer (10 km radius) areas of the mine.

A Detailed Biological Study has been done prior to the preparation of this Management plan, encompassing the existing flora, fauna and their habitat. We have taken up extensive study of the flora and fauna in the core zone and the buffer zone of the Mining Lease and have had intensive interactions with the officials of forest, mining and other departments working in the area, besides the forest field staff, VSS and local villagers etc.

We gathered information of movement of Elephants in groups in the Impact Zone of the mine area though rarely man-animal conflicts have taken place in few occasion along with instances of crop damage by the elephant herds within the zone of influence. However, the area does not form part of any National Park or Sanctuary but it is at a distance of 18.5 Km from the Boundary of the Karo – Karampada Elephant Corridor. Taking all aspects into account we have prepared the Wildlife Management Plan based on the Guidelines issued by the Principal Chief Conservator of Forests (Wildlife) & CWLW Odisha vide Memo no. 9094 Dt. 17.09.2021.

Divisional Forest Officer
Keonjhar Division

Divisional Forest Officer
Keonjhar Forest Division
Keonjhar

CONTENTS

EXECUTIVE SUMMARY

The Jajang iron mine was earlier operated by M/s Ranguta Mines Ltd. whose lease was expired on 31.3.2020.

In pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated December 6, 2019 for commencement of the auction process to grant the mining lease in respect of Jajang Iron Ore Block over an area of 666.15 ha. as per ROR, DGPS (669.078 ha.) in villages Jajang, Jadibahal, Palashaka and Bandhuabeda under Barbil Tehsil of Keonjhar District, Odisha.

The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for the said mineral block and M/s JSW Steel Limited was declared as the preferred bidder under Rule 9(9)(iii) of Mineral (Auction) Rules 2015.

The present lessee started its mining operation over 666.15 ha.

The applied RML area consists of :

Sl. No.	Area	Details
1	Total concession area	666.15 ha. as per ROR (669.078 ha. as per DGPS computation)
2	Forestland with status	Forest – 543.916 ha.
3	Non-Forest Govt & Private land with status	125.162 ha.
4	Revenue survey details of the area	Referred to Land Schedule.

In cognizance the letter No. J-11015/57/2020-IA.II(M) dt. 5.2.2021, by the Impact assessment Division of Ministry of Environment, Forest & Climate Change, Government of India , under the Standard TOR for Mining Project stated in the condition No. 16 & 18.

Para 16-A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted".

Para 18- "A detailed biological study area core zone and buffer zone (10 km radius of the periphery of the mine lease) shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled fauna found in the study area, the necessary plan

along with budgetary provisions for their conservation should be prepared in consultation with state forest and wild life Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

A Detailed Biological Study has been done prior to the preparation of this Management plan, encompassing the existing flora, fauna and their habitat. We have taken up extensive study of the flora and fauna in the core zone and the buffer zone of the Mining Lease and have had intensive interactions with the officials of forest, mining and other departments working in the area, besides the forest field staff, VSS and local villagers etc.

The Jajang Iron ore mines of M/s JSW Pvt. Ltd. is located in the village (s) of villages of Jajang. Jadibahal, Palasa (ka) Bandhuabeda under Tehsil Barbil, District Keonjhar, Odisha.

According to the jurisdiction of forest department, the project area comes as under Forets beat Jajang, Forest section Bamebari, Forest Range- Berbil, Division- Keonjhar,

The lease area falls between Latitude 21054'44.23926" N - 219 56 08.1152" N and Longitude 85926'14.555"E - 850 26'50.70226" E on Survey of India Topo sheet No. 73 G/5 (F44N5).

There are no perennial nala in the lease area. The seasonal water ways like gullies, streamlets and nalas drain the surface run-off water during rainy season. Two nalas namely Tapadihi Nala and Karo Nadi pass within the lease are.

A small stream exists on the northern side of the lease area, which meets river Baitarani. River Baitarani flows outside the lease area on eastern side. The eastern side is drained by gullies which meet Baitarani River. Study of the ZOI reveals that important ridges and river channels have by and large are with northwest and south east trend. All the major perennial water courses flow towards north – west and east. The water divide between the two sub – watersheds (Kundra nalla and Baitarani) also trends northwest and south west.

The particular land scape i.e lease area is not source of any river and stream. However some seasonal Nalas water channels originate from the lease area and drain the surface run-off to river Baitrani which flows on the north east side of the lease.

The common species of Flora resent in the Project Area and Project Impact area comprise of Babul, Acacia, Sal, Mahul, Kumbhi, Kendu, Boro, Champa, Kadamba etc. The forest type present is 3C/C2e (ii) Tropical Moist Deciduous Forest and 5B/1CNorthern Tropical Dry Deciduous Forests.

The common Species of Wildlife found in the Project Area and Project Impact Area the mammals are Wild Boar, Junglr Cat, Elephant, Hyena, Jackal, Sloth Bear, Indian Hare etc. The Reptiles in and around are Chandra boda, Ajagara/Rock Python, Indian Rock Lizard etc. The Avian species in the surrounding being Jungle Fowl, Patridge, Samll Blue Kingfisher, Indian Roller, Indian Cuckoo etc along with the amphibian species of Burrowing frog, Brahmuni benga etc.

The area does not form part of any National Park or Sanctuary but it is at a distance of 18.5 Km from the Boundary of the Karo – Karampada Elephant Corridor.

The climate in the area is generally cold in winter between November & February and hot is summer between March and June. The monsoon sets in late June and continues up to the end of August. Temperature shows the variation of 9 degree C to 44 degree C.

The Wildlife both in Project area and the Project Impact Area are likely to be affected due to Mining activities and ancillary activities of transportation and carrying of minerals and ore in the mining zone. Though there doesn't seem to be any significant effect on forest cover and habitat for wildlife, but the effects of noise, air, sound pollution along with lightening and other anthropogenic pressures cannot be pre-permitted.

Movement along Karo – Karampada Elephant corridor takes place by the elephants of Odisha and Jharkhand. These elephant move to Karo RF, Uliburu RF, Siddhamath RF, Baitarani RF, Chamakpur RF and Mahaparabat PRF during crop season and stay up to harvesting season i.e. month of December every year and sometimes beyond and cause crop damage on their movement path in Keonjhar Forest Division.

The Project Impact area of Jajang Iron Ore Mines rarely sees man-animal conflict, though important measures are suggested to mitigate the threat to wildlife particularly to the elephants and Sloth Bear in the Buffer zones.

INTERVENTIONS IN THE PROJECT AREA TO BE IMPLEMENTED BY THE PROJECT PROPONENT AT PROJECT COST :

1. M/s JSW Steel Ltd. has proposed Plantation on degraded forest lands, reclaimed pits OB dumps and safety zone inside forest land etc. as per Environmental Plan.
2. Provision have been made for Graded bund all along the of the lease area wherever necessary to allow surface run off during rain to percolate in to the ground instead of causing water pollution in the nalas.
3. Provision for Photo voltaic fencing around the active mining pits inside the ML area.
4. Supply 10 units of high frequency ultra-sonic Sound elephant repellents to the D.F.O., Keonjhar Forest Division with cost of maintenance.

5. Establishing Bulk messaging System for immediate message spreading from field to all grass-root level forest Officials, ROs, ACFs & D.F.O., Keonjhar including the maintenance cost.
6. Provision of Long Range Rechargeable Flash Light torches 200 nos to be supplied to the strategic villagers/VSS members/elephants trackers to wade away elephants/sloth bears.
7. Provision for Purchase and supply of Android based Mobile handsets for quick message transmitting and immediate communication.
8. Provision of 02 (Two) nos. Drone camera with accessories to Divisional Forest Office Keonjhar or monitoring of wild animals in stress in forest areas.
9. Provision of a hire vehicle with POL for movement of rapid movement team to the man-elephant conflict site.
10. Provision of health camp and cattle immunization camps.

INTERVENTIONS INSIDE THE PROJECT IMPACT AREA :

A) Keonjhar Forest Division.

1. Provision for fodder plantation consisting of fodder species, fruits bearing species for the wild animals by the side of nalas, swamps located insides of forest areas of impact zone.
2. Provision of the firefighting squad with basic firefighting equipment located at the proximities of forest areas will be selected to assist in fire control activities.
3. Provision proposed to procure strategic tools such as 10 nos. of fire blowers.
4. Provision for soil and moisture conservation measure in Sidhamatha, Baitarani and Chamakpur forest block to prevent soil erosion and enhancement of natural regeneration.
5. Fencing of Unguarded open wells 10 Nos.
6. Provision of warning & wading system to prevent elephant intrusion along with maintenance of same.
7. Provision for augmentation of staff strength by creation of a new cadre of Anti-poaching/Anti depredation squad.
8. Provision for construction of grain store house.
9. Provision for supply of metallic grain bin to the victim of crop and house damage to store their grains.
10. Provision for elephant proof trench to prevent entry of elephant to the villages.
11. Provision for Camera trap with infrared.
12. Provision for Manchan (Mini watch tower) to watch the movement of elephant and to alert the villagers against crop/house.
13. Provision for large size radium painted sign board at the elephant road crossing points on NH/State Highway. Inscribing awareness for the vehicles/publics.
14. Provision for annual clearance of shrubs/herbs/grass at the site of road crossing of elephants at a width of 50 meter on both the side of road/NH/SH.
15. Provision for Corpus Fund.
16. Monitoring and evaluation and procurement of satellite maps have been proposed.

B) Bonai Forest Division.

1. Provision for augmentation of staff strength by creation of a new cadre of Anti-poaching/Anti depredation squad.
2. Establishing Bulk messaging System for immediate message spreading from field to all grass-root level forest Officials, ROs, ACFs & D.F.O., Bonai including the maintenance cost.
3. Supply 5 units of high frequency ultra-sonic Sound elephant repellents to the D.F.O., Bonai Forest Division with cost of maintenance.
4. Provision of Long Range Rechargeable Flash Light torches 200 nos. to be supplied to the strategic villagers/VSS members/elephants trackers to wade away elephants/sloth bears.
5. Provision for Camera traps and equipments etc.
6. Provision for warning & wading system to prevent intrusion of elephants in to villages/corn fields.
7. Provision for fire blowers to extinguish forest fire and preparation of fire line wherever required.
8. Provision for paddy harvester for the villagers for early harvesting of paddy from their field and to store in safe place to avoid crop damage by wild elephants.
9. Provision for Corpus Fund.
10. Provision for cattle immunization camps.

The Plan has been prepared for a period of 10 years. Interim revision may be done evaluating the result of the presumptuous. The Project proponent undertakes to prepare subsequent plans in continuation to this plan.

M/s JSW Steel Ltd. will carry out works proposed in this plan with respect to the project area under the supervision of DFO, Keonjhar Forest Division, who will execute different interventions in the project impact area under the supervision of monitoring of The Regional Chief Conservator of Forests, Rourkela.

750.768 lakh

The Total cost of the Plan including 20% extra for escalation of wage rate and material costs is Rs. **749.208 lakhs**. From the said an amount **Rs. 470.400 lakhs** and **Rs. 278.808 lakhs** shall be spent by the **DFO, Keonjhar Division** & **Bonai Division** respectively for execution of different interventions in the Project Impact Area of both the divisions. The Project proponent M/s JSW Ltd. shall deposit said amount in adhoc CAMPA fund with respective Divisional Forest Officer after approval of the plan.

471.96 lakh

In addition to the above, M/s JSW Steel Ltd. shall be executing different interventions as proposed in the plan at the project cost besides various safeguard measures as prescribed under Mining Plan, Environment Management Plan and submitting compliance to various authorities.

Divisional Forest Officer
Bonai Division

Divisional Forest Officer
Keonjhar Division

Chapter–I

INTRODUCTION:

a) **Brief Description of project :**

JSW steel a flag ship company of the diver sited US$ 14 billion JSW Group which has a leading presence in sectors such as steel, energy, infrastructure, cement, sports among the others. From a single manufacturing unit in the early 1980s, JSW steel ltd today, is one of the foremost integrated steel company in India with an installed capacity of 18 MTPA and was planning to scale up in India and overseas. It has been widely recognized for its business and operational excellence.

Jajang Iron ore mines (erstwhile lessee M/s Ranguta Mines Limited) was one of the mines whose lease expired on 31.03.2020. Government of Odisha vide letter No. 30007/s & M/Bhubaneswar/IV (Misc) SM-66/2016 dated 18th March 2020 issued the notice for grant of Mining Lease (ML) for Jajang Iron Ore Block over an area of 666.15 ha as per ROR (669.078 ha. as per DGPS computation) in villages Jajang , Jadibahal, Palsa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar District, Odisha with a mineable reserve size of about 34.87 Million tones (Mt).

In pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated 6th December, 2019 for commencement of the auction process to grant the mining lease in respect of Jajang Iron Ore Block Odisha. The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for the said mineral block and M/S JSW Steel Limited was declared as the Preferred Bidder under Rule 9191 (iii) of mineral (Auction) Rules, 2015.

Without rejudice to the generality of the provisions under section 8B (2) of the MMDR Act, 1957, the details of the valid rights , approvals, clearance licenses, and the alike held by the previous lessees are vested in favor of M/s JSW Steel Ltd. by the Govt. of Odisha for a period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearance , licenses, permits and the like, whichever is earlier vide order No.- 4190/SM, dated 29.05.2020**.**

M/s JSW steel Limited being successful bidder upon execution of mining lease deed, or the successful Bidder shall immediately, but not later than one hundred twenty days from the date of execution of mining lease, apply afresh for all necessary rights, approvals, clearances licenses and like under the applicable statutes, rule and regulation, as the case may be, for obtaining the necessary clearance to enable further continuance of the mining operations beyond two years and vesting order shall be valid for a

period of two years from the date of execution of new lease deed or till the date of getting all fresh approvals, clearance, licenses, permits, and the like whichever is earlier."

Subsequent to signing of the MDPA, M/s JSW Steel Limited has made payment of the third installment being the eighty percent of the upfront value and executed and registered the mining lease with the Government of Odisha on 27.06.2020 and the mining lease was granted in favor of M/s JSW Steel Limited for a period of 50 years w.ef 27.06.2020.

b) **Cost of the project :**

Total total capital investment is about **485 crore** which includes the cost of the mine development, plant and machinery, utility fecilities and mine closure cost.

c) **Location** :

The Jajang Iron ore mines of M/s JSW Pvt. Ltd. is located in the village (s) of village Jajang, Jadibahal, Palasa (ka) Bandhuabeda under Barbil Tahsil, of Keonjhar District, Odisha.

Forest Beat	:	Jajang
Forest Section	:	Bamebari
Forest Range	:	Badbil
Forest Division	:	Keonjhar
G.P.	:	Jajang
CD Block	:	Joda
District	:	Keonjhar

The lease area falls between Latitude 21054'44.23926" N - 219 56 08.1152" N and Longitude 85926'14.555"E - 850 26'50.70226" E on Survey of India Topo sheet No. 73 G/5 (F45N5).

The project impact area (10 km radius) comes under Survey of India Topo Sheet No. F45N5, F45N9, and F45H8 & F45H12. Spreading over two Divisions i.e. Keonjhar Division and Bonai Division.

d) **Nature and extent of land required** :

Sl. No.	**Area**	**Details**
1	Total concession area	666.15 ha. as per ROR (669.078 ha. as per DGPS computation)
2	Revenue Forest land with status	Forest – 543.916 ha.
3	Non-Forest Govt & Private land with status	125.162 ha.

e) **Condition imposed in state-I/EC regarding SSWLCP** :

On application of user agency, Ministry of Environment, Forest & climate change (Impact Assessment Division) 'Govt of India vide F.No. J-11015/57/2020-IA. II (M) dated 05.02/.2021 issued TOR (Terms of reference) under EIA notification 2006 for EIA study to issue Environmental Clearance for the above project.

In para 16 &18 of Standard Terms of Reference (TOR) for mining Project MOEF has stipulated as under.

Para 16-A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted".

Para 18- "A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease) shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present.

In case of any scheduled fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with state forest and wild life Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

Therefore, in pursuance to the above letter of MOEF & C.C and TOR stipulated there in, this **Site Specific Wild Life Conservation Plan** is prepared basing on the TOR in para 16 and 18 of standard TOR for mining project.

Besides as per stipulation a detail Biological study of the study area encompassing flora & fauna, endangered, endemic and RET species separately for core and buffer zone based on field survey indicating schedule of the fauna has been done and detailed mitigative measures with budgetary provision for their conservation are being narrated in the foregoing chapters both for core and buffer (10 km radius) zone of the mine.

Chapter–II

A) Description of project area and impact area.

Project area : The project area/lease area spreading over an area of 666.15 ha. occurs on Survey of India topo sheet No. 73G/5 (F45N5) between latitude 21054'44.23926" N - 219 56 08.1152" N and Longitude 85926'14.555"E - 850 26'50.70226" E. The elevation of the lease area varies from 415-411 mt. from the mean sea level. It is octagonal in shape & the north eastern boundary coincides with the bank of Baitarain River. Joda–Bamebari–Dubna road is just passing in the extreme western part and Jakhapura-Bansapani railway line branch of East cost railway divide the lease area form the south to north of the lease area. The area is a hilly terrain with rugged topography and has a few seasonal and semiperenial nalas.

General Geology : This deposit forms a part of Banded Iron Formation (BIF). Due to intensive deformational events, various fold patterns developed in the area. Due to weathering, it is difficult to establish the exact succession of rocks with in the area.

A generalized succession may be given as follows:

	Soil
	Laterite
	Dolerite
	Granite
Iron Ore Series	Banned Hematite Jasper (BHJ)
	Iron Ore Deposits
	Shale
	Shale with Managanese Ore

The Banded Hematite Jasper (BHJ) constitutes the permanent ridges, which are capped with Iron Ore. At foot or slope of the hills, deposition of float ores is also noted.

All the rocks occurred in the area chemically consists of Fe, Al, Si, P, O, etc. There is no toxic material with these rocks.

i) Locations : The Jajang Iron ore mines of M/s JSW Pvt. Ltd. is located in the village (s) of village Jajang, Jadibahal, Palasa (ka) Bandhuabeda under Tehsil Barbil, District Keonjhar, Odisha.

ii) **Land use** : The present (Exesting) land use pattern, proposed land use pattern at the end of plan period and post mining land useis furnished as under :

DETAILS OF EXISTING (PRESENT) LAND USE PATTERN

Particulars	Area in Ha
Area under mining	243.862
Storage of top soil	-
Waste dump site	44.495
Mineral storage and MSP	49.873
Infrastructure workshop, admin, Building etc.)	0.13
Roads	9.304
Own railways line & siding	13.112
Tailing pond	-
Effluent Treatment plant	-
Mineral separation plant	-
Mine camp (Township area)	10.271
Others (Greenbelt + Plantation) water reservoir	34.653
Parking plaza/ Parking yard	0
Solar power system	0
Sub Total	405.700
Others un disturbed	263.378
Grand total	669.078

Source: IBM Approved Mine plan

PROPOSED LAND USE AREA AT THE END OF PLAN PERIOD

Particulars	Area in Ha
Area under mining	277.378
Storage of top soil	-
Waste dump site	34.727
Mineral storage and MSP	70.16
Infrastructure workshop, admin, Building etc.)	1.63
Roads	9.304
Own railways line & siding	13.112
Tailing pond	-
Effluent Treatment plant	-
Mineral separation plant	-
Mine camp (Township area)	10.271
Others (Greenbelt + Plantation) water reservoir	34.653
Parking plaza/ Parking yard	3.16
Solar power system	26.89
Sub Total	481.285

Particulars	Area in Ha
Others un disturbed	187.793
Grand total	**669.078**

POST MINING LAND USE

Sl. No.	Name of Mining features	Name of Post Mining Land Use	Area (Ha)
1	Quarry	Reclamation (back filling & Plantation/re-grassing)	94.24
2	Quarry	Rehabilitation (Plantation/re-grassing)	171.641
3	Quarry	Rehabilitation (Water Reservoir)	9.71
4	Waste Dump	Dump Plantation	40.697
5	Infrastructure	Office, colony will be handed over to state govt.	1.63
6	Mineral Processing Plant & Storage	Plantation	70.16
7	Railway line	Plantation	13.112
8	Construction of road	Plantation	9.304
9	Safety zone(ML Boundary)	Plantation	34.653
10	Parking plaza/Parking yard		3.16
11	Solar Power system		26.89
12	Sub total		475.197
13	Camp area	---	10.271
14	Undisturbed area	--	178.527
15	Grand Total	---	669.078

Source: IBM Approved Mine plan

iii) **Human habitation** : The lease area/mine area do not contain any human habitations. Hence mining activities do not involve displacement of any human settlement.

B) Project impact area :

The project impact area at a radius of 10 KM fall in both Keonjhar division and Bonai division (Sundargarh district) with an approximate area of **228 Sqkm. and 26 Sqkm.** respectively.

i) The forest area of **Keonjhar division** part comprises Chamakpur RF, part of Siddhamatha RF, part of Baitarani RF and Revenue forest like Mahaparabata, Dandahudi, Manguguru and Hillocks containing open scrubs forest and dence sal forest such as

Bisadhara pahada, Geraeda pahada, Ranga pahada, Jandaragi pahada, Pilitangara pahada occring the project impact area.

Banai division part of impact area contains only some fragmented patches of open scrubs forests surrounded by villages and habitations.

ii) **Land use** of the impact area are as follows :

- Reserve Forest area is about 11,544 ha.
- Revenue Forest comprising of open mixed forest is about 9,676 ha.
- Hence total forested area is about 21,220 ha.
- Total homestead, agricultural and Govt. non-forest land comprises about 15,556 ha.

iii) **Human habitation** : There are about 75 nos. of villages and hamlets in the project impact area of the mine in both the divisions with a total population of around 43,335. This population has 67% S.T. and 9% S.C. The mining and allied activities employ 73.6% of workers, agriculture 11.9% (seasonal), which together make 41% work force. Non workers constitute 57% of the population. About 5,000 trucks are engaged in ore transportation. This brings in a floating population of 10,000 plus to the zol. All human activities in forest or in its surrounding affect wildlife in one way or other.

Inside the project impact area, there area about 57 nos. of active and inactive mining leases occurring both in forest land Govt. non-forest and tenanted land covering an area of about 1178 ha. honey combing the entire project impact area and leaving the wildlife habitat in fragmented condition

iv) **The project area & the impact area does not form part of any wildlife sanctuary, national park, Eco-sensitive zone, Elephant & Tiger reserve, Biosphere reserve & Elephant corridor.**

A statement showing below the distances of nearest protected areas, tiger reserve, elephant reserve & Ramasora sites, Elephant corridors are furnished below :

Sl. No.	Elephant corridor	Km
1	Maulabhanja, Jiridimali, Anantpur	110.8km
2	Kartapat Uriadani	279.2 km
3	Kotagrah Chandrapur	298.6 km
4	Badampahad Karida East	76.7 km
5	Badampahar Dhbadhobin	60.2 km
6	**Karo Karampada**	**18.5 km**
7	West Bengal Deuli Suliapada	157.1 km
8	Hadgarh-Kuldhia	115.3 km
9	Buguda central RF	184.8 km
10	Nuagaon Baruni	156.5 km
11	Barpahar Tarva Kantamal	214.8 km
12	Tal Kholgarh	180.2 km
13	Telkoi Palhara	62.7 km
14	Kanheijena Anantpur	98.3 km
15	Similipal- Hadgarh –	100.6 km

Sl. No.	List of National Park, Sanctuary, Tiger Elephant Reserve, Ramsar site Odisha	Distance from the project site (Kms)
	National Park	
1	Similipal(Proposed National Park)	73.2
2	Bhitarkanika(National Park)	207.6
	Wildlife Sanctuary	
1	Bhitarkanika	194.7
2	Balukahnd-konark	235.4
3	Baisipalli	170.7
4	Badrama	115.8
5	Chilika(Nalban)	248.2
6	Chandka-Damapara	167.7
7	Debrigarh	177.6
8	Gahirmatha (Marine)	212.4
9	Hadgarh	118.1
10	Khalasuni	112.3
11	Kuldiha	126.8
12	Nandankanan	176.4
13	Similpala	67.2
14	Satkosia gorge	145.2
15	Sunabeda	330.3
16	Karlapat	332.7
17	Lakharibeli	303.8
18	Kotogada	278.2
19	Kapilash	140.5

Tiger Reseve		
1	Similpala	67.2
2	Satkosia	145.2
Elephant Reserve		
1	Mahandi	145.2
2	Mayurbhanja	40.2
3	Sambhalpur	115.8
Ramsar Site		
1	Bhitarkanika	186.7
2	Chilika	226.5

v) In view of TOR in para-18 of the above MoEF letter a detail biological study of the project area and project impact area have been carried out from March 2021 to May 2021 to study the flora and fauna. Therefore, study of flora, fauna, forests etc. of the project impact area has been included in the biodiversity study of the area.

The bio diversity study has been conducted by Maharaja Sriram Chandra Bhanja Deo University (Erstwhile) North Orissa University, Baripada the work of which has been assigned by the User Agency to collect information that would help in developing site specific wildlife conservation plan. In addition, the information collected would serve as a protocol, which would aid in demonstrating or exhibiting the status of the landscape of interest to the concerned stakeholders to undertake appropriate restoration measures. Hence the present study aims at assessing the biodiversity of lease and its buffer area of 10 km radius with the following objectives.

The basic objectives of the assignment are to rationalize the protocol for an effective Biodiversity management plan for the proposed project area. This has been attempted by the following objectives:

- Collection and synthesis of secondary information on the status of biodiversity in project area.

- Undertake intensive field survey to assess the status of floral & faunal component in different habitats in core and buffer areas of project site.

- Authenticating the report on Wildlife management plan by forest department authority.

- Identification and listing of flora and fauna which are important as per the Wildlife (Protection) Act 1972.

- Suggest conservation and management plan to improve the habitat quality of the project area and to conserve the overall biological diversity of flora and faunas in the study area.

Activities undertaken during the study:

1. **For Flora survey:**
   - Tree, shrub, herb, climber and grass species identification and
   - enumeration
   - Diversity of species under plantations
   - Analysis of Rare-Endangered-Threatened flora

2. **For Fauna survey**
   - Documentation of Avian, Reptilian, Amphibian, Mammal and
   - other faunal diversity
   - Observations by direct and indirect evidences (Direct evidence- Sighting and hearing, Indirect evidence- Pug marks, nests and other signs
   - Analysis of Scheduled species.

3. Habitat/microhabitat diversity in the project site and surrounding areas within 10 km range from the site.

4. Photo documentation.

Approach of the study :
To assess the ecological issues and document flora and fauna associated with the project following tasks were undertaken :

1. Preliminary visit on the site
2. Review of literature
3. Core Site and Buffer area Survey

<u>Methodology</u>

Review of literature :
The purpose of the literature study was to identify habitats and species of local conservation value which may not have been present or apparent during the survey visit (e.g. spring/monsoon plants). The study was also helpful in understanding the historical biodiversity and ecological status of the site.

The desk study was carried out by referring the hard copy literature related to ecology and biodiversity of the region or of other related areas encompassing the proposed site.

Habitat Survey :
To collect data on flora (Herbs, Shrubs and Trees) and fauna (Birds, Insects, Reptiles, Mammals) various strategies were practiced. These strategies differed as per the habit and habitat of concerned group of species.

vi) **Flora** :
The structure and composition of vegetation and forest cover was studied by using phytosociological methods of vegetation survey, to analyze and estimate biodiversity, density, dominance and frequency of different members of plant populations. Observations were made in the forest area (as possible) as well as in non-forest area by laying plots and adopting quadrate method. The quadrate method includes laying down square sample plots or units for quantitative analysis of vegetation. It is actually the sample plot method given by Clements (1898); Philips (1959); Muller and Ellenberg (1974) and Rau and Wooten (1988) EIA Hand Book ch.7, pp.44). Quadrate sizes of 1 m x 1m, 5m x 5m and 10m x 10m were taken for herbs, shrub and trees respectively.

Co-existence and competition both are affected directly by the number of individuals in the community. Therefore, it is essential to know the quantitative structure of the community. To characterize the community as a whole, certain derived parameters are used i.e. Density, Frequency, Abundance, Importance Value Index and Simpson Diversity Index give a clear picture of community structure in quantitative terms. The value of a parameter as estimated from the representative samples it is generally near to the real value.

To characterize the vegetation in the study area, the data was collected and analyzed for describing the properties of vegetation with reference to species composition and functional attributes. Importance Value Index is the average of Relative Density, Relative Dominance, and Relative Frequency. The formulae incorporating different parameters analyzed and assessed for obtaining the baseline status of terrestrial biodiversity is presented as below:

Method for Analyzing Phytosociological Characteristics of Vegetation
Formulae used for various calculations are :

$$\text{Density (D)} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrats of occurrence}}{\text{Total number of quadrats studied.}} \times 100$$

Relative Density (RD) = $\frac{\text{Number of individuals of a species}}{\text{Total number of individuals of all species}} \times 100$

Relative Frequency (RF) = $\frac{\text{Number of occurrence of a species}}{\text{Total number of occurrence of all species}} \times 100$

Species diversity indices like Shannon-Wiener Index (H) and Simpson Index (CD) were calculated as per Magurran (1988) using following formulae :

Shannon-Wiener Index (H') = $-\sum pi \ ln \ pi$
Simpson index (Cd) = $\sum pi^2$

Where, *pi* is the proportion of individuals of the ith species; $pi = Ni / N$, *Ni* is the number of individuals in the i^{th} species and *N* is the total number of individuals of all species in the stand.

Species diversity is one of the efficient ways to analyze community structure. Simpson Diversity Index takes into account the density of individual species as well as total density of all species. Lower values of Species Diversity Index indicate a healthy ecosystem and the higher values show disturbance in an ecosystem due to environmental stress.

Fauna and Avifauna:
The assessment of wild fauna was mostly based on random sightings. The Core zone is a mining dominated landscape and therefore not much sightings of fauna were possible. The Faunal diversity in the core site was limited to Butterflies, insects, Rats and common lizards. This has a very poor avifaunal diversity. Possibility of bigger mammals is very low due to the cumulative disturbance caused by the mine dominated landscape, blasting and operation . In the Buffer region due to the presence of reserve forests, there was a good diversity of birds, butterflies and other insects.

To study faunal diversity and richness in the area, extensive survey was done for all part of the Study area to collect data on invertebrates, fishes, amphibians, reptiles, birds and mammals. Information on invertebrates was obtained through direct searching method, which include visual encounter surveys (Heyer *et al*, 1994).Butterflies are small insects. Which require to identify, very close study. So for the identification we had to catch the butterflies with the help of butterfly net and after photography and identification released these into the same habitat. For better identification of the butterflies used the book of Haribal(1992), Kunte(2000), and Kehimkar (2008). For fishes trapping method was used, which is one of the most versatile fish censusing method (Sutherland, 1996). Like that of invertebrates taxonomic and ecological data on herpetofauna in the area was collected

systematically through direct searching method. Avifauna of the study area was surveyed through visual encounter by line and road transect method (Buckland *et al,* 1993). In addition to these methods vocal individuality method (Saunders and Wooler, 1988) was also used to identify some bird species, because many species of birds are detected by their calls and songs (Rappole *et al.*, 1993). In case of mammalian fauna modified transect method (Burnham *et al.*1980) was used and transects were laid randomly to find out abundance and rarity of mammals. Animals on both side of the transect were listed. Direct and indirect evidences were collected from primary and secondary sources and people were also interviewed to collect data from them (Das, 2010). The indirect evidences such as scats/droppings, feathers, scales or hairs were collected to get species level confirmation in doubtful cases. Permanent hair materials preserved and were used as reference materials for comparison. The observations made during the study phase in the site are as follows:

Sampling Stations:
The propose project is located in the Jajang, Jadibahal, Palsa (Ka), Bandhuabeda, villages of Barbil in the district of Keonjhar. Majority of the region falling in the 10 km radius consist of Industrial landscape, very limited Agricultural landscape and Forest landscapes often interrupted by mining projects.

Sampling locations were strategically selected to collect maximum data on vegetation pattern, faunal diversity and Habitat diversity. In total 20 samples were taken around 10 sampling locations in areas demarcated as core zone (lease area) and buffer zone (upto 10 km from leasehold) of Jajang mine.

The study for biological environment were taken in forest area(reserved forests), like Chamkpur RF – 1 km, Baitrani RF – 3 km , Sidhamatha RF – 6 km& Mahaprabat Forest – 3.5 km. and villages Jajang, jadibahal, Palasa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar district.

Observations:
Observations were made for all possible habitats and flora-fauna species in and around the site (except microorganisms). All possible landscape features and areas in the site and buffer areas were visited to collect the required amount of data. The observations recorded are site, time and season specific observations. However, the actual observation data was supported by the data obtained from secondary sources (reports, research papers, literature survey) to gather a wide and in-depth perspective.

The ecological richness and sensitivity of the locations were examined critically. Almost all the major habitats in the buffer area were visited and observation was recorded.

Habitat and Forest Type Diversity:

The project is located in the Jajang village of the Keonjar district. The mining lease area is approachable from NH 215 road which divides the lease area in to 2 parts. It can be approached from Barbil which is situated at a distance of 23km (by road) in the Northeast or from Koira which is at a distance of 11 km (by road) in the Southwest. The nearest Rail Head is at Barbil (both Passenger and goods train). The region falls in to the North Western part of Orissa state and is bounded on the North by Jharkhand State, on the South by Jharsuguda & Sambalpur district, on the east by the Rourkela Forest division and the West and Northwest by Chhatishgarh state.

The region falling in to the 10 km radius from the project location is diverse in habitat and therefore study of Habitat and Forest type diversity was undertaken to understand different types of habitats and forests that are prevalent in the region.

Habitats are decisive factors and determine the diversity and distribution of flora and fauna in any given ecosystem. Therefore, it is vital to understand dynamics and diversity of habitats and micro ecosystems in and around the proposed project. Actual field observation coupled with Toposheet and Google earth images were used to characterize and distinguish landscape diversity in the study site and the buffer area. The overall examination was carried out by making actual visits at various pre marked locations in the core site (lease area) and the region falling within the 10 km radius of the project location (Buffer area). The buffer area was divided in to two parts (5km and 10km) to make the assessment and interpretation convenient.

vii) **The Core Zone** :

The lease area is an undulating terrain with occasional hills within the area, studded with flat topped low ridges, reassembling a relict type of topography controlled by differential hardness of rocks. The maximum RL of the area is 660m. and the minimum RL of the area is 498m.

The area show scattered vegetation as most of the area is utilized for mining and related allied activities. The area is mainly covered by bushes. The core site (Lease area) has plantation areas and some small vegetation patches that include forest based species. The forest based species are low in numbers. The tree divesity indicated dominance of Shorea robusta(Sal) followed by plantation specific such as a cassia siamea

(Chakhunda) and gmelina arborea (shivan) but the herbs and shrubs diversity was dominated by weeds such as Ageratum and Eupatorium.

The small patches of forest vegetation is potential for being used as nesting-browsing habitats for faunal species such as a Birds, Butterflies, Moths, Rodents, Hare, Reptiles and Lizards.

viii) **Areas within 10 km range: Buffer zone.**

Within the 10 km area comprising of Buffer zone, there are some major reserve forests such as Chamkpur RF – 1 km, Baitrani RF – 3 km, Sidhamatha RF – 6 km & Mahaprabat Forest – 3.5 km. These forests represent the natural ecology of the region and are mostly characterized by plant species such as*Shorea robusta, Diospyros melanoxylon, Diospyros montanna, Terminalia arjuna, Terminalia tomentosa, Anogeissus latifolia, Buchanania lanzan, Haldina cordifolia* and *Madhuca indica* etc. The overall landscape is undulating and the elevation ranges from 1900-2300 ft.

The dominant vegetation in the forests in the Buffer zone can be broadly categorized as a Moist and Dry Sal Forest (Government of Orissa 1994). The forest type prevalent in the buffer area can be classified on the basis Champion and Seth classification (1968) as Northern Tropical Moist Deciduous Sal (80 %) and Northern Tropical Dry Deciduous forest (20%).

Majority of the landscape falling in the buffer zone is dominated by industrial and mining projects, wastelands and discontinuous agricultural landscapes. Natural landscape and forest cover is interrupted by various mining projects and there has been cumulative degradation of the natural landscape. Majority of the reserve forests observed during the study were fragmented.

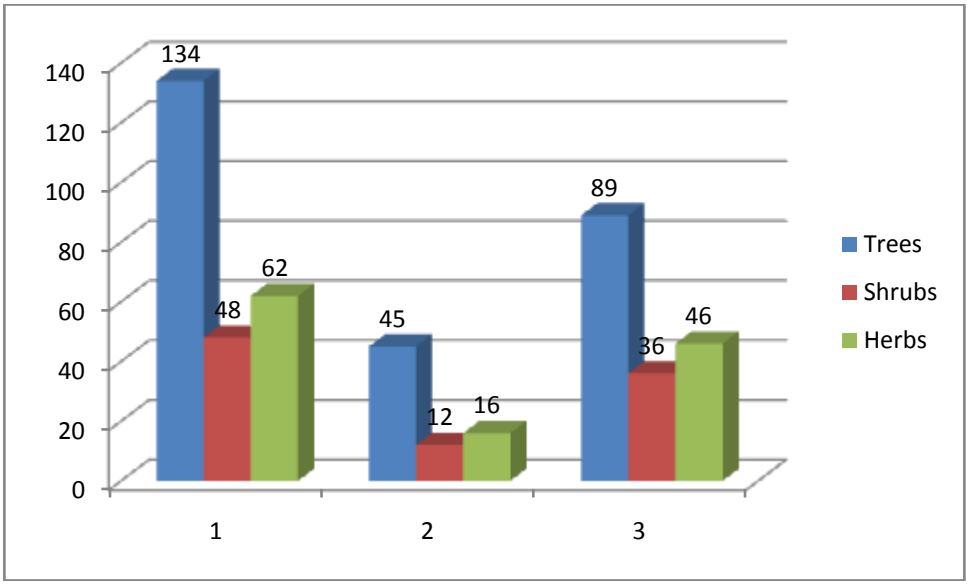
Floristic diversity

The vegetation in the RF / PF areas in the study area,

For the present biological study of Jajang, Twelve (12) transects for vegetation cover and transects for fauna study were studied in each site to evaluate the vegetation composition and wildlife status. The common and dominant species was recorded in the data sheet in order to prepare the inventory for wildlife fauna and flora. The longitude and latitude were recorded from the study site to know the accurate location provided in the table below :

List of Latitude & Longitude for quadrate study.

Sl. No.	Name of site	Latitude	Longitude	Altitude in meters
1	Mines	21° 56’23.0658"N	85°25'35.8788"E	444.06
2	Mines	21° 56’35.30796"N	85°26'5.31868"E	420.77
3	Mines	21° 55’57.93924"N	85°25'51.00708"E	538.78
4	Lease area	21° 55’57.66996"N	85°25'51.03012"E	435.19
5	Road side towards mines	21° 56’35.5532"N	85°26'4.93872"E	538.78
6	Plantation	21° 56’30.89688"N	85°25'59.65284"E	435.34
7	Plantation Village forest	21° 56’31.24752"N	85°26'2.27664"E	437.11
8	Sal vegetation plot	21°56’27.25693"N	85°25'54.4422"E	461.17
9	Water body in the core area	21°55’55.29108"N	85°25'1.72128"E	448.16
10	Baitarini River	21°1’45.8454"N	85°07'22.91808"E	78.97
11	Boundary pillar	21° 55’28.03152"N	85°27'11.3022"E	444.06
12	Gurutuan Village	21° 55’10.07052"N	85°27'23.80644"E	437.11



Habit-wise status of floristic composition of study area

Sl. No	Habit	Species	Core area	Buffer area
1	*Trees*	134	45	89
2	*Shrubs*	48	12	36
3	*Herbs*	62	16	46
Total		**244**	**73**	**171**

BASELINE STATUS OF FLORA

Flora of the project area and impact areas are classified in to in to Terrestrial and Aquatic flora.

Terrestrial Flora

Terrestrial flora consists of the following :

1) Agriculture crops cultivated (cereals, pulses and vegetables) during rainy season (Kharif) and post rainy moths of winter season (Rabi);
2) Commercial crops;
3) Natural vegetation of Forest type includes endemic species/ endangered species.
4) Plantations and Agro-forestry species and
5) Grass lands.

1. Floral diversity in Core Area :

In total 73 plant species belong to 45 trees, 12 shrubs, and 16 herbs were recorded during the field survey. The core zone mainly consists Forest land. The core zone is dominated with species like *Acacia auriculiformis, Shorea robusta, Aegle marmelos, Azadirachta indica, Terminalia tomentosa, Bauhinia vahlii, Grewia tillafolia, Adina cordifolia, Ficus racemosa* and *Tinospora cordifolia*. The details list of flora is given in list of Flora is given in Table No.4.

2. Floral diversity in Buffer Area :

In total 171 plant species belong to 89 trees, 36 shrubs, and 46 herbs were recorded during the field survey The higher frequency species in buffer area are *Shorea robusta* followed by *Azadirachta indica Aegle marmelos, Syzygium cumini, Pongamia pinnata, Semicarpus anacardium*, *Ficus bengalensis, Emblica officinalis, Terminalia arjuna, Lagerstroemia parviflora,* and *Saraca indic,*. The details list of flora is given in list of Flora is given in Table No –.4: List of Plants (Tree species in core area)

LIST OF FLORA IN THE CORE ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Acacia/ Sunajhari	*Acacia auriculiformis*	Mimosaceae	
2	Babul	*Acacia nilotica*	Mimosaceae	
3	Bela	*Aegle marmelos*	Rutaceae	
4	Chatiana	*Alstonia scholaris*	Apocynaceae	
5	Amba	*Mangifera indica*	Anacardiaceae	
6	Mahanimba	*Ailanthus excels*	Simarubaceae	
7	Sirisa	*Albizia procera*	Mimosaceae	
8	Nima	*Azadirachta indica*	Meliaceae	
9	Panasa	*Artocarpus heterophylla*	Moraceae	

Sl. No.	Local name	Botanical name	Name of class/Family	
10	Chara	*Buchanania lanzan*	Anacardiaceae	
11	Kanchana	*Bauhinia racemosa*	Cesalpiniaceae	
12	Siali	*Bauhinia variegate*	Caesalpiniaceae	
13	Simili	*Bombax ceiba*	Bombaceae	
14	Sunari	*Cassia fistula*	Caesalpiniaceae	
15	Khakada	*Casearia elliptica*	Flacourtiaceae	
16	Kumbhi	*Careya arborea*	Lecythidaceae	
17	Kendu	*Diospyros melanoxylon*	Ebenaceae	
18	Dimiri	*Ficus hispida*	Moraceae	
19	Boro	*Ficus bengalensis*	Moraceae	
20	Mahula	*Madhuca longifolia*	Sapotaceae	
21	Karanja	*Pongamia pinnata*	Fabaceae	
22	Palasha	*Butea parviflora*	Fabaceae	
23	Karada	*Cleistanthus collinus*	Euphorbiaceae	
24	Putuli	*Croton roxburghii*	Euphorbiaceae	
25	Sisoo	*Dalbergia sissoo*	Fabaceae	
26	Pahadia sisso	*Dalbergia latifolia*	Fabaceae	
27	Sahada	*Streblus asper*	Moraceae	
28	Sal	*Shorea robusta*	Dipterocarpaceae	
29	Siju	*Euphorbia neriifolia*	Euphorbiaceae	
30	Rohini	*Soymida febrifuga*	Meliaceae	
31	Jamun	*Syzigium cumini*	Myrtaceae	
32	Kasi	*Bridellia retusa*	Euphorbiaceae	
33	Kochila	Strychnos nuxvomica	Loganiaceae	
34	Kurei	*Holarrhena antidysentrica*	Apocynaceae	
35	Khaira	*Acacia catechu*	Mimosaceae	
36	Asana	*Terminalia tomentosa*	Combretaceae	
37	Arjuna	*Terminalia arjuna*	Combretaceae	
38	Eucalyptus	*Eucalyptus hybrid*	Myrtaceae	
39	Mahanimba	*Melia azadirachta*	Meliaceae	
40	Gambhari	*Gmelina arborea*	Verbenaceae	
41	Tentuli	*Tamarindus indica*	Caesalpiniaceae	
42	Teak	*Tectona grandis*	Verbenaceae	
43	Borakoli	*Ziziphus oenoplia*	Rhamnaceae	
44	Krushna chuda	*Delonix regia*	Caesalpiniaceae	
45	Kusuma	*Schleichera oleosa*	Sapindaceae	

LIST OF SHRUB SPECIES IN THE CORE ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Basanga	*Adhatoda zeylanica*	Acanthaceae	
2	Murga	*Agave americana*	Agavaceae	
3	Dahanimari	*Ageratum conyzoides*	Asteraceae	
4	Ata	*Anona squamosa*	Annonaceae	
5	Siali	*Bauhinia vahlii*	*Caesalpiniaceae*	
6	Polash	*Butea parviflora*	Fabaceae	
7	Noi palaso	*Butea superba*	Fabaceae	
8	Arakha	*Calotrpis gigantean*	Asclepiadaceae	
9	Kharkhari	*Clerodendrum viscosum*	Verbenaceae	
10	Koarada	*Cleistanthus collinus*	Phyllanthaceae	
11	Atundi	*Combretum roxburghii*	Combretaceae	
12	Putuli	*Croton roxburghii*	Euphorbiaceae	

LIST OF HERB SPECIES IN THE CORE ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Arkho	*Calotropis gigantea*	Asclepiadaceae	
2	Arkho	*Calotropis procera*	Asclepiadaceae	
3	Buroria	*Canscora diffusa*	Gentianaceae	
4	Nalita	*Chorcorus olitorius*	Tiliaceae	
5	Bano sorisa	*Cleome viscosa*	Capparidaceae	
6	Kharkhari	*Clerodendrum infortunatum*	Verbenaceae	
7	Bansaru	*Colocasia esculenta*	Arecaceae	
8	Kansira	*Commelina benghalensis*	Commelinaceae	
9	Nalita	*Corchorus aestuans*	Tiliaceae	
10	Gotha	*Croton oblongifolius*	Euphorbiaceae	
11	Jhunjhunca	*Crotalaria albida*	Fabaceae	
12	Chhani	*Crotalaria calycina*	Fabaceae	
13	Banhaldi	*Curcuma aromatica*	Zingiberaceae	
14	Talmuli	*Curculigo orchiodes*	Amaryllidaceae	
15	Salaparni	*Desmodium gangeticum*	Fabaceae	
16	Pita alu	*Dioscorea wallich*	Dioscoreaceae	

LIST OF FLORA (TREE SPECIES) IN THE BUFFER ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Acacia/ Sunajhari	*Acacia auriculiformis*	Mimosaceae	
2	Babul	*Acacia nilotica*	Mimosaceae	
3	Khaira	*Acacia catechu*	Mimosaceae	
4	Kuruma	*Adina cordifolia*	Rubiaceae	
5	Bela	*Aegle marmelos*	Rutaceae	
6	Mahanimba	*Ailanthus excels*	Simarubaceae	
7	Sirisa	*Albizia procera*	Mimosaceae	
8	Chatiana	*Alstonia scholaris*	Apocynaceae	
9	Cashew	*Anacardium occidentale*	Anacardiaceae	
10	Dhaura	*Anogeissus latifolia*	Combretaceae	
11	Kadamba	*Anthocephalus kadamba*	Rubiaceae	
12	Matha saga	*Antidesma ghaesembilla*	Euphorbiaceae	
13	Nunannunia	*Antidesma acidum*	Meliaceae	
14	Bantala	Ardisia solanacea	Myrsinaceae	
15	Panasa	*Artocarpus heterophylla*	Moraceae	
16	Nima	*Azadirachta indica*	Meliaceae	
17	Hinjal	Barringtonia acutangula	Myrtaceae	
18	Kanchana	*Bauhinia racemosa*	Cesalpiniaceae	
19	Siali	*Bauhinia variegate*	Caesalpiniaceae	
20	Simili	*Bombax ceiba*	Bombaceae	
21	Kasi	*Bridellia retusa*	Euphorbiaceae	
22	Chara	*Buchanania lanzan*	Anacardiaceae	
23	Palasha	*Butea parviflora*	Fabaceae	
24	Palas	*Butea monosperma*	Fabaceae	
25	Potua	*Catunaregam spinosa*	Rubiaceae	
26	Kumbhi	*Careya arborea*	Lecythidaceae	
27	San chakunda	*Cassia siamea*	Caesalpiniaceae	
28	Sunari	*Cassia fistula*	Caesalpiniaceae	
29	Khakada	*Casearia elliptica*	Flacourtiaceae	
30	Kumbhi	*Careya arborea*	Lecythidaceae	
31	Karada	*Cleistanthus collinus*	Euphorbiaceae	
32	American simili	*Ceiba pentadra*	Malvaceae	
33	Bheru	*Chloroxylon swietenia*	Flindersiaceae	
34	Kendu	*Diospyros melanoxylon*	Ebenaceae	
35	Putuli	*Croton roxburghii*	Euphorbiaceae	

Sl. No.	Local name	Botanical name	Name of class/Family	
36	Sisoo	*Dalbergia sissoo*	Fabaceae	
37	Pahadia sisso	*Dalbergia latifolia*	Fabaceae	
38	Krushna chuda	*Delonix regia*	Caesalpiniaceae	
39	Kukurdanti	*Garuga pinnata*	Burseraceae	
40	Kurei	*Holarrhena antidysentrica*	Apocynaceae	
41	Rai	*Dillenia pentagyna*	Dilleniaceae	
42	Gambhari	*Gmelina arborea*	Verbenaceae	
43	Ghurudu	*Gardenia gummifera*	Rubiaceae	
44	Siju	*Euphorbia neriifolia*	Euphorbiaceae	
45	Eucalyptus	*Eucalyptus hybrid*	Myrtaceae	
46	Dimiri	*Ficus hispida*	Moraceae	
47	Boro	*Ficus bengalensis*	Moraceae	
48	Amba	*Mangifera indica*	Anacardiaceae	
49	Achu	*Morinda pubescens*	Rubiaceae	
50	Amla	*Phyllanthus emblica*	Euphorbiaceae	
51	Baula	*Mimusops elengii*	Sapotaceae	
52	Bankapasia	*Kydia calycina*	Malvaceae	
53	Moi	*Lannea coromandelica*	Anacardiaceae	
54	Siddha	*Lagerstroemia parviflora*	Lythraceae	
55	Manda	*Macaranga peltata*	Euphorbiaceae	
56	Mahula	*Madhuca longifolia*	Sapotaceae	
57	Kamala gundi	*Mallotus phillippensis*	Euphorbiaceae	
58	Karanja	*Pongamia pinnata*	Fabaceae	
59	Mahanimba	*Melia azadirachta*	Meliaceae	
60	Champa	*Michelia champaca*	Magnoliaceae	
61	Debadaru	*Polyalthia longifolia*	Annonaceae	
62	Parashi	*Millusa velutina*	Annonaceae	
63	Godikoima	*Mitragyna parvifolia*	Rubiaceae	
64	Gandhasal	*Polyalthia cerasoides*	Annonaceae	
65	Gangasiuli	*Nyctanthes arbor-tristis*	Nyctanthaceae	
66	Patharchampa	*Ochna obtusata*	Ochnaceae	
67	Phanaphana	*Oroxylum indicum*	Bignoniaceae	
68	Radhachuda	*Peltophorum ferrugineum*	Caesalpiniaceae	
69	Rimuli	*Protium seeatum*	Burseraceae	
70	Piasal	*Pterocarpus marsupium*	Fabaceae	
71	Muchukunda	*Ptetospermum acerifolium*	Malvaceae	
72	Kusuma	*Schleichera oleosa*	Sapindaceae	
73	Kochila	Strychnos nuxvomica	Loganiaceae	
74	Jamun	*Syzigium cumini*	Myrtaceae	

Sl. No.	Local name	Botanical name	Name of class/Family	
75	Tentuli	*Tamarindus indica*	Caesalpiniaceae	
76	Teak	*Tectona grandis*	Verbenaceae	
77	Bhalia	*Semicarpus anacardium*	Anacardiaceae	
78	Sal	*Shorea robusta*	Dipterocarpaceae	
79	Rohini	*Soymida febrifuga*	Meliaceae	
80	Genduli	*Sterculia urens*	Sterculiaceae	
81	Sahada	*Streblus asper*	Moraceae	
82	Asana	*Terminalia tomentosa*	Combretaceae	
83	Arjuna	*Terminalia arjuna*	Combretaceae	
84	Bahada	*Terminalia bellirica*	Combretaceae	
85	Harida	*Terminalia chebula*	Combretaceae	
86	Kharkas	*Trema orientalis*	Ulmaceae	
87	Kangra	*Xylia xylocarpa*	Fabaceae	
88	Kanteikoli	*Ziziphus mauritiana*	Rhamnaceae	
89	Borakoli	*Ziziphus oenoplia*	Rhamnaceae	

LIST OF FLORA (SHRUB SPECIES)IN THE BUFFER ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Basanga	*Adhatoda zeylanica*	Acanthaceae	
2	Murga	*Agave americana*	Agavaceae	
3	Dahanimari	*Ageratum conyzoides*	Asteraceae	
4	Atta	*Anona squamosa*	Annonaceae	
5	Siali	*Bauhinia vahlii*	*Caesalpiniaceae*	
6	Polash	*Butea parviflora*	Fabaceae	
7	Noi palaso	*Butea superba*	Fabaceae	
8	Arakha	*Calotrpis gigantean*	Asclepiadaceae	
9	Kharkhari	*Clerodendrum viscosum*	Verbenaceae	
10	Koarada	*Cleistanthus collinus*	Phyllanthaceae	
11	Atundi	*Combretum roxburghii*	Combretaceae	
12	Putuli	*Croton roxburghii*	Euphorbiaceae	
13	Arguna	*Cycas circinallis*	Cycadaceae	
14	Dudura	*Datura metal*	Solanaceae	
15	Boinchakoli	*Flacourtia jangomas*	Flacourtiaceae	
16	Ranikathi	*Flemingia chappar*	Fabaceae	
17	Bhurudu	*Gardenia gummifera*	Rubiaceae	
18	Modimodica	*Helicteres isora*	Sterculiaceae	
19	Kurei	*Holarrhena pubescens*	Apocynaceae	
20	Gileri phul	*Indigofera cassioides*	Fabaceae	

Sl. No.	Local name	Botanical name	Name of class/Family	
21	Basanga	*Justicia adhatoda*	Acanthaceae	
22	Nagairi	*Lantana camara*	Verbanaceae	
23	Manjuati	*Lawsonia inermis*	Lythraceae	
24	Kamalagundi	*Mallotus philippensis*	Euphorbiaceae	
25	Khirkichikanta	*Mimosa himalayana*	Mimosaceae	
26	Bhusunga	*Murraya koenigii*	Rutaceae	
27	Gangasiuli	*Nyctanthes arbor-tristis*	Oleaceae	
28	Poksunga	*Pogostemon benghalensis*	Lamiaceae	
29	Giringa	*Pterospermum acerifolium*	Sterculiaceae	
30	Potua	*Randia dumetorum*	Rubiaceae	
31	Gaba	*Ricinus communis*	Euphorbiaceae	
32	Arguna	*Vernonia aspera*	Asteraceae	
33	Begonia	*Vitex nigundo*	Verbenaceae	
34	Dhatuki	*Woodfordia fructicosa*	Lythraceae	
35	Kankoli	*Ziziphus oenopila*	Rhamnaceae	
36	Barokoli	*Zyzyphus xylopyrus*	Rhamnaceae	

LIST OF FLORA (HERBS SPECIES) IN THE BUFFER ZONE OF JAJANG IRON ORE MINES				
Sl. No.	**Local name**	**Botanical name**	**Name of class/Family**	
1	Indramaris	*Acalypha indica*	Euphorbiaceae	
2	Apamaranga	*Achyranthes aspera*	Amaranthaceae	
3	Dantari	*Acaccia pennata*	Mimosaceae	
4	Dhatuki	*Woodfordia fruticosa*	Lythraceae	
5	Pauncia	*Aerva lanata*	Amaranthaceae	
6	Madranga	*Alternanthera sessilis*	Amarantha	
7	Bankolthi	*Atylosia scarabaeoides*	Fabaceae	
8	Leutia saga	*Amaranthus viridis*	Amaranthaceae	
9	Ban olua	*Amorphophallus bulbifera*	Arecaceae	
10	Mamuri	*Antidesma diandrum*	Euphorbiaceae	
11	Pokasungha	*Ageratum conyoides*	Asteraceae	
12	Jhalai	*Byophytum sensitivum*	Oxalidaceae	
13	Poksunga	*Blumea lacera*	Asteraceae	
14	Puruni	*Boerhavia diffusa*	Nyctaginaceae	
15	Bana chakunda	*Cassia tora*	Caesalpiniaceae	
16	Bana sorish	*Cleome viscosa*	Capparaceae	
17	Arkho	*Calotropis gigantea*	Asclepiadaceae	
18	Arkho	*Calotropis Procera*	Asclepiadaceae	
19	Buroria	*Canscora diffusa*	Gentianaceae	
20	Nalita	*Chorcorus olitorius*	Tiliaceae	

Sl. No.	Local name	Botanical name	Name of class/Family	Sl. No.
21	Bano sorisa	*Cleome viscosa*	Capparidaceae	
22	Kharkhari	*Clerodendrum infortunatum*	Verbenaceae	
23	Bansaru	*Colocasia esculenta*	Arecaceae	
24	Kansira	*Commelina benghalensis*	Commelinaceae	
25	Nalita	*Corchorus aestuans*	Tiliaceae	
26	Jhunjhunca	*Crotalaria albida*	Fabaceae	
27	Banhaldi	*Curcuma aromatica*	Zingiberaceae	
28	Talmuli	*Curculigo orchiodes*	Amaryllidaceae	
29	Salaparni	*Desmodium gangeticum*	Fabaceae	
30	Pita alu	*Dioscorea wallich*	Dioscoreaceae	
31	Mayurchulia	*Elephantopus scaber*	Asteraceae	
32	Chitakuti	*Euphorbia hirta*	Euphorbiaceae	
33	Baincha koli	*Flacourtia jangom*	Flacourtiaceae	
34	Anatamula	*Hemidesmus indicus*	Asclepiadaceae	
35	Kalam saga	*Ipomea aquatic*	Convolvulaceae	
36	Bhuinkurwan	*Ixora arborea*	Rubiaceae	
37	Baigaba	*Jatropha curcas*	Euphorbiaceae	
38	Banmali	*Jasminum arborescens*	Oleaceae	
39	Kala mahajal	*Lygodium flexuosum*	Lygodiaceae	
40	Lajkoli	*Mimosa pudica*	Mimosaceae	
41	Mundi	*Mitragyna parviflora*	Rubiaceae	
42	Lamiaceae	*Ocimum basilicum*	Bantulasi	
43	Bhuin anal	*Phyllanthus niruri*	Euphorbiaceae	
44	Bichhuati	*Tragia involucrate*	Euphorbiaceae	
45	Bisalyakarani	*Tridax procumbens*	Asteraceae	
46	Gileri	*Tephrosia purpurea*	Fabaceae	

LIST OF FLORA (CLIMBERS) OF JAJANG IRON ORE MINES				
SL No	**Local name**	**Botanical name**	**Name of class/Family**	
1	Atundi	*Combretum roxburghii*	Combretaceae	
2	Baidanka	*Macuna pruriens*	Papilionaceae	
3	Bichhuati	*Tragia plukenetii*	Euphorbiaceae	
4	Muturi	*Smilax macrophylla*	Liliaceae	
5	Suamloi	*Ichnocarpus frutiscens*	Apocynaceae	
6	Gulchi	*Tinospora cordifolia*	Menispermaceae	
7	Noi palaso	*Butea superba*	Fabaceae	

LIST OF GRASS LAND SPECIES IN THE CORE ZONE/BUFFER ZONE

Sl. No.	Botanical name	English name	Name of class/Family	Core zone	Buffer zone
1	Apluda mutica L.	Mauration grass	Poaceae	+	+
2	Aristida setacea Retz.	Broom grass	Poaceae	+	+
3	Arundo donax L.	Giant Reed	Poaceae	-	+
4	Bambusa arundinaceae L.	Bamboo	Poaceae	+	+
5	Cynodon dactylon (L.) Pers.	Bermuda grass	Poaceae		
6	Dactyloctenium aegyptium(L.) Willd.	Crow foot grass	Poaceae	+	+
7	Eragrostis amabilis (L.) Wight &Arn.	Love grass	Poaceae	+	+
8	Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.	Spear grass,	Poaceae	+	+
9	Imperata cylindrical (L.) Raeusch	Cogon grass	Poaceae	+	+
10	Setaria faberi Herrm	Japanese bristle grass	Poaceae	+	+

Source : Field survey and Interaction with local peoples

FAUNAL DIVERSITY

The Core site is a mining dominated landscape and therefore not much sightings of animal was possible. The faunal diversity in the core site was limited to Butterflies, insects, Rats and common lizards. The core site has a very poor Avifaunal diversity. Possibility of bigger mammals is very low due to the cumulative disturbance caused by the mine dominated landscape. In the Buffer region due to the presence of Reserve forests, there was a good diversity of Birds, Butterflies and Other insects.

To study faunal diversity and richness in the area, random sightings were preferred and various methods of observation were practiced. For reptiles, stone lifting was done; rock crevices and wall space of structures in the site were checked. Amphibians were searched near the stagnant water pools and small streams. Insects were observed on underside of leaves, nests, rock crevices, bushes and other places. Birds were studied by undertaking several field trails in and around the site.

The observations made during the study phase in the site are as follows:

Mammal diversity:
No mammals other than common Squirrel and domesticated cows or dogs were seen in and around the core site. On random survey and talking with local people, it was learnt that Jackals and Sloth bear are found in the reserve forest areas in the buffer region. On the basis of direct sightings, questioners and indirect evidences, the presence of faunal species such as Wild Boar, Jackals, Fox, Hare, Porcupine and Indian Mongoose were validated.

List of Mammals that can be found in the buffer region is attached in the Table.

Avian diversity:
In areas falling within the core zone (lease area) and adjoining areas, 05 species of birds were observed during the study. The observations were made based on direct sightings and birdcalls. In the observed list of birds, none of the species were classified as Endangered or rare. All of these birds observed were of least concern classification. It must be noted here that though the birds species recorded during the survey are of least concern classification, necessary steps must be undertaken to reduce the impact on the reserve forest areas that support majority of the Avian diversity. A list of Bird species observed during the study is shown in Table

Reptile and Amphibian diversity:
During the survey, 3 species of reptiles and 2 species of amphibians were found in areas close to the project site. On expanding the survey to nearby ranges in the Buffer region, 9 species of reptiles and 4 species of amphibians were encountered. The list of Reptiles and amphibian species is shown in Table

There is no Wild Life Sanctuary or National Park within the study area of 10 km. Karo - Karampada elephant corridor is located at about 12.5 km from the mine lease area. The site specific Wildlife Conservation Plan has been prepared & got approved by PCCF (Wildlife), Chief Wildlife Warden, Odisha. The detailed faunal species is as follows:

LIST OF MAMMALS WITHIN THE CORE AREA				
Sl. No.	**Local Name**	**English Name**	**Zoological Name**	**Schedule**
1	Barha	Wild Boar	*Sus scrofa*	III
2	Bilua	Jackal	*Canis aureus*	II
3	Heta	Hyaena	*Hyaena hyaena*	III
4	Jhinka	Porcupina	*Hystyrix indica*	IV
5	Neula	Mongoose	*Herpestes eduardsii*	II
6	Gunduchi musa	Striped squirrel	*Funambulus pennati*	IV

LIST OF BIRDS WITHIN THE CORE AREA				
1	Bana kukuda	Jungle fowl	*Gallus gallus*	IV
2	Kapta	Ring Dove	*Streptopelia chinensis*	IV
3	Koel	Cuckoo	*Eudynamis Scolopaceus*	IV
4	Kumbhatua	Crow pheasant	*Centropus asiatisa*	IV
5	Gunduri	Patridge	*Perdicula asiatisa*	IV
6	Bani	Common Myna	*Acridotheres tristis*	IV
7		Common tailorbird	*Orthotomus sutorius*	IV
8		Red vented bulbul	*Pycnonotus cafer*	IV
LIST OF REPTILES WITHIN THE CORE AREA				
1	Dhamana	Rat snake	*Ptyas mucosus*	II
LIST OF AMPHIBIANS WITHIN THE CORE AREA				
1	Frog	Common Indian toad	*Euphlyctis cyanophlyctis*	IV
2	Frog	Indian Bull frog	*Hoplobatrachus tigerinus*	IV

Fauna in Buffer Zone

LIST OF MAMMALS WITHIN THE BUFFER AREA				
Sl. No	**Local Name**	**English Name**	**Zoological Name**	**Schedule**
1	Barha	Wild Boar	Sus scrofa	III
2	Bana bilei	Jungle cat	Felis chausaffinia	II
3	Bilua	Jackal	Canis aureus	II
4	**Hati**	Elephant	Elephas maximus	**I**
5	Heta	Hyaena	Hyaena hyaena	III
6	Jhinka	Porcupina	Hystyrix indica	IV
7	Neula	Mongoose	Herpestes eduardsii	II
8	**Bhalu**	Sloth bear	Melursus ursinus	**I**
9	Mankad	Langoor	Presbytis entellus*I*	III
10	Neula	Mangoose	Herpestes edurdsii *I*	II
11	Thekua	Hare	Lepus nigricollis	IV
LIST OF BIRDS WITHIN THE BUFFER AREA				
1	Bana kukuda	Jungle fowl	*Gallus gallus*	IV
2	Kapta	Ring Dove	*Streptopelia chinensis*	IV
3	Koel	Cuckoo	*Eudynamis Scolopaceus*	IV
4	Kumbhatua	Crow pheasant	*Centropus asiatisa*	IV
5	Kau	House crow	*Corvus splendens*	V
6	Gunduri	Patridge	*Perdicula asiatisa*	IV
7	Sua	Indian myna	*Acridotherses tristris*	IV
8	Macharanka	SmallBlueKingfisher	*Alcedoatthis*	IV

9		Little egret	*Egretta garzetta*	IV
10	Roller	IndianRoller	*Coraciasbenghalensis*	IV
11	Kite	Pariah Kite	*Milvus migrans lineatus*	IV
12	Drongo	BlackDrongo	*Dicrurusadsimilis*	IV
13	Cormorant	LittleCormorant	*Phalacrocorax niger*	IV
14	Bulbul	RedVentedBulbul	*Pycnonotuscafer*	IV
15	Greenbulbul	Chloropsis(greenbulbul)	*Chloropsisaurifrons*	IV
16		Black-naped Oriole	*Oriolus chinensis*	IV
17		Green Bee-eater	*Merops orientalis*	IV
18	Kite	Black Kite (Pariah Kite)	*Milvus migrans*	-
19		Purple Sunbird	*Nectarinia asiatica*	IV
20	Haladibasanta	Black-naped Oriole	*Oriolus chinensis*	IV
21	Haladibasanta	Black hooded oriole	*Oriolus xanthornus*	IV
22		Common tailorbird	*Orthotomus sutorius*	IV
23	Ghar chatia	House sparrow	*Passer domesticus*	IV
24		Yellow Wagtail	*Motacilla flava*	IV
25	Sua	Alexandrine Parakeet	*Psittacula eupatria*	IV
26	Flycatcher	Asian Paradise-Flycatcher	*Terpsiphone paradise*	IV
27		Brown-headed Barbet	*Megalaima zeylanica*	IV
28		Common Babbler	*Turdoides caudatus*	IV
29	Pipit	Paddyfield Pipit	*Anthus rufulus*	IV
30		Pied bushchat	*Saxicola caprata*	IV
31		Purple rumped sunbird	*Leptocoma zeylonica*	IV
32		Scarlet Minivet	*Pericrocotus flammeus*	IV
33		White browed wagtail	*Motacilla maderaspatensis*	IV

LIST OF REPTILES WITHIN THE BUFFER AREA

1	Chandra boda	Chandra boda	*Vipera russelli*	II
2	**Ajagara**	Rock Python	*Python molurus molurus*	**I**
3	Chiti	Common Indian Krait	*Bungarus caeruleus*	IV
4	Naga sapa	Indian cobra	*Naja naja*	II
5	Dhamana	Rat snake	*Ptyas mucosus*	II
6	Bahurupi endua	Pohelaendua	*Chamaeleozeylanicus*	II
7	Endua	Common garden lizard	*Calottes versicolor*	III
8	Endua	Indian Rock Lizard	*Psammophilus Blanfordanus*	IV
9	Chamepei neula	Snake skink	*Riopa punctata*	IV

LIST OF AMPHIBIANS WITHIN THE BUFFER AREA				
1	Frog	Indian Bull Frog	Rana tigrina	IV
2	Frog	Frog	Rana hexdactyla	IV
3	Frog	Water skipper	Rana cyanohryictis	IV

Checklist of Butterflies in Core and Buffer Area

Sl. No.	Scientific name	Common name	Status	Core Area	Buffer Area
	Tirumala limniacae	Blue tiger	Common	+	+
	Danaus chrysippus	Plain Tiger	Common	+	+
	Ixias Marianne	White –orange Tip	Common	+	+
	Papilio polytes	Common mormon	Common	+	+
	Precis orithya	Blue Pancy	Common	-	+
	Precis hierta	Yellow Pansy	Common	+	+

Odonates of Study Area

Sl. No	Family	Scientific name
1	Aeshnidae	*Anax guttatus*
2	Gomphidae	*Ictinogomphus rapax*
3		*Paragomphus lineatus*
4	Libellulidae	*Bradinopyga geminate*
5		*Branchythemis sp*
6		*Crocothemis servilia*
7		*Neurothemis fulvia*
8		*Orthetrum pruinosum*
9		*Potamarcha obscura*
10		*Potamarcha congener*
11		*Tramea basilaris*
12		*Trithemis pallidinervis*
13	Coenagrionidae	*Aciagrion hisopo hisopa*
14		*Agriocnemis pygmaea*
15		*Ceriagrion olivaceum*
16		*Cercion malayanums*
17		*Cercion calamorum*
18		*Ischnura aurora*
19	Lestidae	*Lestes elatus*
20		*Lestes viridulus*
21	Protoneuridae	*Disparoneura sp*

Soil fauna includes Microfauna, Mesofauna and Macrofauna as Collembola (Springtails), Lumbricina (earthworms), nematodes, Isoptera (termites), Acari (mites), Enchytraeid worms, small Diplopoda (millipedes), and many small larval and adult insects, Macrofauna: Isopoda (woodlice), larger Diplopoda, earthworms, Isoptera (termites), Coleoptera (beetles),Diptera (flies), ants, and molluscs.

Aquatic Fauna in the project area-

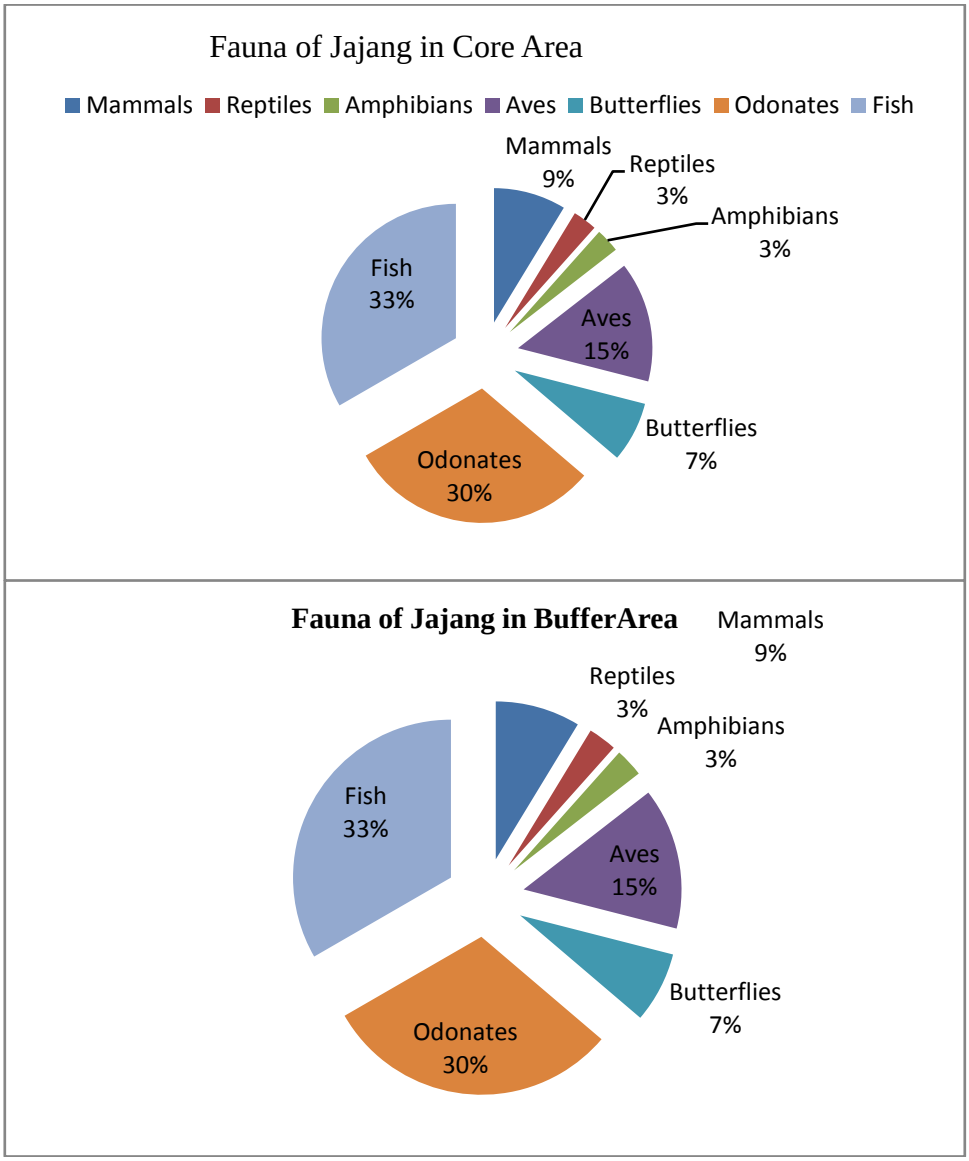
Fish diversity recorded in study area

Sl. No	Family	Scientific name	Status in
1	Catla	*Catla catla*	LC
2	Rohu	*Labeo rohita*	LC
3	Mrikali	*Cirrhinus mrigala*	LC
4	Bata	*Labeo bata*	LC
5	Puti	*Puntius ticto*	LC
6	Magur	*Clarias batrachus*	LC
7	Singhi	*Heteropheustis fossilis*	NA
8	Sol	*Ophiocephalus str iatus*	LC
9	Lata	*Ophiocephalus punctatus*	NA
10	Fali	*Notopterus notopterus*	LC
11	Mahurali	*Amblypharyngodon mola*	LC
12	Dandikiri	*Rasbora daniconius*	LC
13	Karandi	*Punctitus conchonius*	LC
14	Mentua	*Garra mullya*	LC
15	Kantia	*Hemibagrus menoda*	LC
16	Tudi	*Macrognathus aculeatus*	LC
17	Chandakudi	*Chanda nama*	LC
18	Gadisha	*Channa punctata*	LC
19	Chingudi	Prawn sps.	LC
20	Pita Kerandi	Puntius conchonius	LC
21	Baunsapatri	Salmophasia bacaila	LC
22	Kantia	*Mystus vittatus*	LC
23	Kau	*Anabas cobojius*	LC

LC= Least Concern, NA= Not Assessed

Percentage presence of all Fauna types in the Study Area

Fauna of Core Area



Excepting schedule – 1 fauna like Elephant, Sloath Bear& Rock Python & other Fauna as narrated above no other Fauna are noticed in the study area. Besides there are **no endemic** species are found in the study area however Elephant is the only schedule – 1 Fauna (threatened species) are noticed here.

ix) **Movement pattern of mega fauna, wildlife corridors, human wildlife conflict** :

Due to mosaic of mines, human habitations and agricultural land, forest connectivity between Chamakpur, Baitrani, Siddhamatha & Mahaparbat PRF is drastically affected.

One important source of water is Baitani River but most animals are prevented to make use of the river water due to cluster of mines on its west bank and further beyond. Fragmentation of the habitat has affected movement pattern of elephants, and made the forest vulnerable to loss of species and disappearance of genetic diversity within the species by isolating populations of several animals, creating conditions for inbreeding and paving the way for extinction.

As lease area do not involve any forest blocks & includes only bushy revenue forest & surrounded by habitations and other infrastructure like railways, roads etc., hence mega wild life like Elephant hardly visits the lease site. Besides the Karo-Karampada Elephant corridor is about 18 KM from the lease outside the project impact area.

Elephants in different groups consisting of 7 too to 17 nos. in each group, known to visit the villages of Panduposi and Harmutu and Karo RF Karampda R.F, Tholkabad R.F of Jharkhand respectively are Elephants habitats. Elephnts move in sidhamatha, Baitrani R.F occurring in impact zone and which are transient habitats. More evidences of Elephants have been recorded under eastern impact zone from depredation data.

- One group migrates from Sidhamatha RF reaches Baitrani RF crosses Kundra nala and then move to Sidhamatha Pahad and then move to Jharngan, Goldaru, Thakurani RF, and Pandrashi PF and come back in same route.
- Another group migrating from Baitrani RF, reaches Khuntpani, Banshapani, Banshapani Pahad and come back in the same route.
- Also wild elephants move to Chamakpur RF, Maha-parbat DPF & adjoining forest patches located around the villages at times during crop season causing man/animal conflict.

As working of mines has influenced to a great extent the movement of Elephants, still there are few number of cases of man and animal conflict including conflict between man and elephant in the process a few human kill was occurred one during 2014 & one during 2016.

There are also instances of killing of other wild animals such as, wild pig Saliaptani and male spotted deer, within the zone of influence.

There are also cases of damage to houses, cops and domestic animals caused by elephant. The details of human and elephant and damage to house, crop and domestic animals as well as information on other wild life access has been enumerated in the forth coming paras.

x) **Man-animal conflict** :

A detail statement of man animal conflict, crop damage, compensation paid, human injury/death wild animal kill of Keonjhar division from the period 2010-11 to 2019-20 is furnished below :

Human death injury

Year	Human death due to Elephant attack	Human death due to Bear attack	Human death due to wild Boar attack	Others	Total
2019-20	8		1		**9**
2018-19	7	6			**13**
2017-18	8	2			**10**
2016-17	7	2	1		**10**
2015-16	10				**10**
2014-15	8	1			**9**
2013-14	6	2			**8**
2012-13	19	3			**22**
2011-12	3	4			**7**
2010-11	7				**7**

Crop Damage

Man animal conflict data for the year 2016-17 to 2020-21 with compensation										
Year	**Human kill**		**Human injury**		**House Damage**		**Crop damage**			**Total**
	Nos of decease	**Compassionate Amount (in Rs.)**	**Nos of Victim**	**Compassionate Amount (in Rs.)**	**Nos of Victim**	**Compassionate Amount (in Rs.)**	**Nos of Victim**	**Area Damaged (in Acr.)**	**Compassionate Amount (in Rs.)**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2016-17	10	3000000.00	34	445000.00	102	340000.00	3762	951.70	9525220.00	13310220.00
2017-18	9	2900000.00	26	415000.00	216	800000.00	3517	905.58	9150740.00	13265740.00
2018-19	14	5600000.00	30	530000.00	104	576000.00	3514	856.256	8707922.00	15413922.00
2019-20	9	3600000.00	38	380000.00	335	2116000.00	3581	904.71	9111540.00	15207540.00
2020-21	6	2nos-800000.00 4nos-160000.00 (advance paid) Total-Rs.960000.00	54	840000.00	139	606000.00	3859	836.49	8541616.00	10947616.00

Elephant Death During 2016-17 to 2020-21								
Sl No.	**Date of Occurrence**	**Sex**	**Name of the Range**	**Name of the Village**	**Name of the Forest**	**Cause of death**	**Latitude**	**Longitude**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
2016-17								
Nill								
2017-18								
1	22.04.2017	Female-40years	Telkoi	Udayagigi (Munda Sahi)		Due to septicemia	N- 21-18-47	E-85-22-27.44
2	14.11.2017	Female-7years	Keonjhar	Near Village Dumuria Rashi field		Natural	N-21-27-27.4	E-85-34-09.0
	Total	2 Nos						
2018-19								
1	24.07.18	Male-12 to 14 Years	Champua	Chamakpur KF. 150 meters away from river Baitarani	Chamakpur KF	Due to shock arising from septicemia	N-21-59-45.93	E- 85-28-21.93
2	21.11.18	Female-30 Years	Keonjhar	Basantpur & Naranpur between Railway Station		Due to Train accident	N- 21-34-39.9	E- 85-38-49.6
3	28.03.19	Male Calf- 1 Month old	Champua	Mahaparbat DPF, Near village Hatimara Chhak	Mahaparbat DPF	Due to cardial (there is Fighting among the male elephant & Female elephant	N-21-51-14.6	E-85-25-16.6
	Total	**3 Nos**						

2019-20								
1	09.04.19	Female- 15 to 20 years	Ghatagaon	Near Gayalmunda Village		Anthrex	N- 21-27-43.7	E- 85-46-15.1
2	22.08.2019	Male Calf	Ghatagaon	Near Balijodi Village		Road Accident	N-21 22 51	E-85 55 33
3	22.08.2019	Adult Female	Ghatagaon	Near Balijodi Village		Road Accident		
4	22.08.2019	Female	Ghatagaon	Near Balijodi Village		Road Accident		
5	07.10.2019	Female	BJP		Uper Sumanth KF	Natural	N- 21 32 44	E- 85 33 52
6	19.02.2020	Male Calf	BJP		Taramakanta DPF	Natural	N-21 37 27	E-85 16 24
	Total	6 Nos						
2020-21								
1	05.05.2020	Gender could not be ascertained	Champua		Kasia KF		N- 21 46 48.3	E- 85 25 11.5
2	24.05.2020	Male(Single Tusker)	Champua		Chamakpur KF	Due to Accute Tympanitis	N- 22 0 49.4	E- 85 29 4.4
3	14.06.2020	Male	Champua		Baitarani A RF	Due to Electrocution	N- 21-58-31.08	E- 85-26-13.7
4	14.06.2020	Female	Champua		Baitarani A RF	Due to Electrocution	N- 21-58-31.08	E- 85-26-13.7
5	03.07.2020	Male Baby elephant	Barbil		Sidhamath RF	Due to respinatory failure		
6	11.09.2020	Female	Keonjhar		Barabanka RF	Presure impacts on hearts & lungs	N-21 21 06	E- 85 58 33
7	16.10.2020	Male calf	BJP	Nadapani village	Taramakanta DPF		N- 21 42 32.0	E- 85 21 49.0

From the above figures it is establishment that no man-Elephant conflicts is recorded in the project area of Jajang mines. Whatever Man-animal conflict recorded in the past is in the project impact area comprising of forest blocks like Chamakpur, Baitrani, and Sidhamatha & Mahaparabat etc. The reason of Elephant death is due various diseases, electrocution& accident etc, for which mitigative measures are being proposed.

ix) Other project or their impact area in the impact area of the JSW Jajang Iron Ore Mines :

The lease area is divided by Jhakapura Bansapani branch of east cost railway from south to north Kalimati - Joda state highway passes bordering the lease area. Beside some village roads, Panchayat roads pass by the side of the lease.

The lease area is surrounded by a cluster of mines of other lessee which are narrated below in a tabular form of course, among those mining lessees some are functional and some are non functional of present

LIST OF ADJOINING LEASE AREA.

SL. NO	NAME OF THE MINE	NAME OF THE LESSEE/ MINE OWNERS	AREA IN HECT	LENGTH	DIRECTION
1	BANDHABEDA Fe MINE	M/S RANGUTA SONS (P)LTD.	22.226	37 mt	EAST
2	PALASA Fe MINE	M/S PATTNAIK MINERALS	106.53	330 mt	WEST
3	BAMEBARI Fe & MN MINE	M/S TISCO	140	0 mt	SOUTH
4	UNCHABALI Fe & MN MINE	M/S ESSCAL MINNING IND.	107.306	2609 mt	SOUTH
5	UNCHABALI Fe & MN MINE	SRI S.N. MOHANTY	19.63	3254 mt	SOUTH
6	UNCHABALI Fe & MN MINE	SMT. INDRANI PATTNAIK	106.1127	4455 mt	SOUTH
7	UNCHABALI Fe & MN MINE	SRI BASANT KUMAR MOHANTY	12.95	5751 mt	SOUTH
8	UNCHABALI Fe & MN MINE	SRI K.C PRADHAN	33.22	5973 mt	SOUTH
9	UNCHABALI Fe & MN MINE	SRI S.D SHARMA	25.45	5858 mt	SOUTH
10	BALDA PALASA & JAJANG Fe MINE	M/S OMC LTD.	681.521	638 mt	SOUTH
11	JAJANG Fe MINE	T.B LAL & CO.	22.69	293 mt	NORTH
12	JILLINGAHAR Fe & MN MINE	M/S OMC LTD.	656.2	351 mt	NORTH
13	JAJANG Fe & MN MINE	SRI H.G PANDYA	100.173	332 mt	NORTH

14	GURUBEDA Fe & MN MINE	M/S OMC LTD.	656.2	2165 mt	NORTH
15	BHALUBEDA Fe & MN MINE	SRI MR DAS	5.139	2888 mt	NORTH
16	GURUBEDA Fe MINE	SRI S.C PADHEY	69.776	3088 mt	NORTH
17	CHAMAKPUR Fe MINE	NARAYANI & SONS	79.794	3572 mt	NORTH
18	BHALUBEDA Fe MINE	M.I.S	62.322	4110 mt	NORTH-EAST
19	CHAMAKPUR Fe MINE	SRI K.C PRADHAN	35.383	6551 mt	NORTH-EAST
20	LARADA MN MINE	S.LAL & CO	202.343	5251 mt	NORTH
21	KHUNTAPANI Fe & MN MINE	SRI S.N MOHANTY	15.378	6726 mt	NORTH
22	BANAPANI Fe & mn mine	SRI S.C PRADHAN	41.682	5318 mt	NORTH-WEST
23	BAITARANI Fe MINE	Dr.S. PRADHAN	52.892	7075 mt	NORTH
24	INGANIJHARANMN MINE	M.D DEB	266.313	6712 mt	NORTH
SL. NO	**NAME OF THE MINE**	**NAME OF THE LESSEE/ MINE OWNERS**	**AREA IN HECT**	**LENGTH**	**DIRECTION**
25	INGANIJHARANMN MINE	M.D DEB	844.93	7873 mt	NORTH
26	JODA Fe MINE	M/S TISCO (JODA EAST)	621.093	6285 mt	NORTH
27	KUDRUPANI Fe & MN MINE	SR R.B DAS	60.255	7719 mt	NORTH-WEST
28	CHORUNDA & KUDRUPANI MN MINE	M/S OMC LTD.	416.835	7027 mt	NORTH-WEST
29	TIRINGPAHAR Fe MINE	M/S OMC LTD.	79.3	5263 mt	NORTH-WEST
30	GURUNDA Fe & MN MINE	M/S TISCO	978	3313 mt	NORTH
31	TIRINGPAHAR Fe MINE	M/S TISCO	195.54	5650 mt	NORTH-WEST
32	JARIBAHAL Fe & MN MINE	M/S TISCO	91	1182 mt	WEST
33	JORURI Fe & MN MINE	TARINI MINIRALS	66.368	1605 mt	WEST
34	KHANDBANDH Fe MINE	M/S OMC LTD.	366.311	2395 mt	WEST
35	KHANDBANDH & JORURI Fe MINE	M/S KALINGA MINING CORP.	73.228	2751 mt	NORTH-WEST
36	JALHURI & BANSPANI Fe & MN MINE	SRI A.RAY & Smt M.RAY	82.109	4899 mt	WEST
37	DALPAHARFe & MN MINE	SRI D.C JAIN	801.172	4793 mt	NORTH-WEST
38	PALASA Fe MINE	M/S PATTNAIK MINERALS	106.53	589 mt	WEST

SL. NO	NAME OF THE MINE	NAME OF THE LESSEE/ MINE OWNERS	AREA IN HECT	LENGTH	DIRECTION
39	BALDA PALASA & JAJANG Fe MINE	M/S OMC LTD.	681.521	638 mt	WEST
40	BALDA Fe MINE	M/S SIRAJUDDIN & CO.	335.594	3522 mt	SOUTH
41	SIAL JODA & GURUDA MN MINE	M/S OMC LTD.	1011.472	2891 mt	SOUTH-WEST
42	GURUDA MN MINE	M/S SIRAJUDDIN & CO.	40.064	3140 mt	WEST
43	SIAL JODA & GURUDA MN MINE	M/S M.G RANGATA	715.639	5432 mt	SOUTH-WEST
44	DARTA IRON & MN MINE	MATADIN SARDA	32.375	6920 mt	SOUTH-WEST
45	GANUA IRON & MN MINE	M/S M.G MOHANTY	82.083	7617 mt	SOUTH-WEST
46	MALDA IRON &MN MINE	M/S TISCO	86.975	5617 mt	WEST
47	MALDA IRON &MN MINE	M/S TISCO	95.283	6740 mt	SOUTH-WEST
48	GANUA IROM & MN MINE	SRI S.N MOHANTY	14.159	5758 mt	SOUTH-WEST
49	GANUA MN MINE	SRI S.N MOHANTY	3.604	5674 mt	SOUTH-WEST
50	GANUA IROM & MN MINE	M/S K.J.S ALLUWALIA	23.3	7135 mt	SOUTH-WEST
51	GANUA IROM & MN MINE	SRI K.C PRADHAN	12.53	5808 mt	WEST
52	GANUA IROM & MN MINE	D.K BAI PANDYA	129.179	6735 mt	WEST
53	GANUA IROM & MN MINE	MAITRI SUKLA	102.89	5536 mt	WEST
54	GANUAGIDEI MANDAJORA IRON & MN MINE	MATADIN SARDA	55.604	8312 mt	WEST
55	PATABEDA IRON & MN MINE	M/S M.G MOHANTY	14	4899 mt	WEST
56	PATABEDA IRON & MN MINE	M/S M.G MOHANTY	19.425	4451 mt	WEST
57	PATABEDA IRON MINE	M/S M.G MOHANTY	28.397	5224 mt	WEST

From the above mining leases occurring in the project impact area about 15 nos. are functional at present and although leased out by Govt. are non-functional at present.

About 68 numbers of sites specific wild life conservation plan have been approved by PCCF wild life & CWLW Odisha pertaining to different forest diversions in Keonjhar forest division where 57 site specific conservation plan pertaining to mining sector have been approved in entire division. As

most of the mines are located in Joda & Barbil range hence more than 90% of the plan relate to those ranges. A detail list of site specific conservation plan approved in Keonjhar division are furnished below:

LIST OF APPROVED SPECIFIC WILDLIFE CONSERVATION PLAN OF KEONJHAR DISTRICT

1. M/s S N Pal, Katasahi & Kolha Rudukela, Manganese Ore Mines.
2. M/s Orissa Sponge Iron Ltd. for mining of Iron Ore in Keonjhar dist.
3. M/s T.P. Mohanty of Keonjhar for mining of Iron Ore & Manganese Ore.
4. Dr. Sarojini Pradhan of Kalaparabat Iron Ore Mines.
5. Dr. Sarojini Pradhan of Balita Iron Ore Mines.
6. M/s R.P. Sao, Guali Iron Ore Mines.
7. Sri kamaljeet Singh Ahluwalia of Nuagaon Iron Ore Mines.
8. M/s Sarojini Pradhan of Baitarani Iron Ore Mines.
9. M/s Sarojini Pradhan of Inganijharan Iron Ore.
10. M/s Sarojini Pradhan of Sidhamath Iron Ore.
11. Jururi Iron Ore Mines of Kalinga Mining Co.
12. Kulam Iron Ore Mining of Adhunik Metals Ltd.
13. Jalahuri Iron & Manganese Mines by M/s Mala Roy & others.
14. Inganijharan Iron & Manganese Ore Mines of Bhanja Minerals.
15. M/s K.N. Ram & Co., Roida-II, iron Ore Mines.
16. Sri K.C. Pradhan, Nayagarh Iron Ore Mining in Keonjhar dist.
17. M/s Mideast Integrated Steels Ltd., - Iron Ore Mining Roida-II in Keonjhar dist.
18. M/s Tarini Minerals Pvt. Ltd., - iron Ore Mining in Keonjhar dist.
19. D.R. Patnaik – Murgabeda Iron Ore Mines in Keonjhar dist.
20. M/s Kaypee Enterprises – Thakurani Iron Ore Mining in Keonjhar dist.
21. Smt. Indrani Patnaik – Unchabali Iron and Manganese Mines in Keonjhar dist.
22. M/s Rungta Mines – Jajang Iron & Manganese Mines.
23. M/s Orissa Mining Corporation Ltd. – Bansapani Iron Ore Mines.
24. M/s Hari Machines – Iron Ore at Basantpur.
25. M/s Mangilal Rungta – Siljora-Kalimati Iron and Manganese Mines.
26. Thakurani Iron Ore Mines Block-B of Sri S. Sarada and Sri M. Sarada.
27. M/s D.C. Jain – Sidhamatta Iron and Manganese Mines.
28. M/s Orissa Mining Corporation Ltd. (SGBK Ion & Manganese Ore).
29. M/s Essel Mining & Industries (Langalota Iron & Manganese Mines).
30. M/s Gandhamardan Sponge Industries (Putulipani Iron Ore Mines).
31. M/s OMDC Ltd-Bagiaburu Iron Ore Mines
32. M/s Hargovind Pandey & others,Jajang iron & Manganese Mines
33. M/s BPME C/o OMDC Ltd. Dalki Manganese Minse
34. M/s OMC Ltd.- Gandhamardan Block-B Iron Ore Mine
35. M/s BPME Ltd C/o OMDC Ltd –Kolha- Roida Iron & Manganese Minse
36. M/s OMC Ltd- Tiring Pahar Iron Ore Minse

37. M/s Rungta Sons P Ltd.- Katasahi Manganese Ore Minse
38. M/s ESSEL Mining & Industries – Kasia Iron & Dolmite Minse
39. Khandabandh Iron Ore Mines by M/s Shree Metalicks
40. Jururi Iron Ore & Manganese Minse of M/s Tarini Minerals (p) Ltd.
41. Katamati Iron Ore Mine by M/s OMC Ltd.
42. Khandabandh Iron Ore Mine by M/s OMC Ltd.
43. Khandabandh Iron Ore Mine of M/s Deepak steel and Power Ltd.
44. Gandhamardhan – A Iron Ore Mine of M/s OMC Ltd.
45. Iron Ore fines Beneficiation Plant & Tailing Dam by M/s Brahmani River Pellets ltd.
46. Balda Block Iron Ore Mine of M/s Seerajuddin & Co
47. Benificiation Plant & Integrated steel Plant at Matkambeda by M/s Aryan Iron & Steel Copany (P) Ltd. (AISCO) and M/s International Mineral Trading Co.(P) Ltd (IMTC)
48. Bolani Iron Ore Minse (5.10 sq. miles) of M/s SAIL
49. Jaribahal Iron Ore mines of M/s Patnaik Mineral Pvt.Ltd.
50. Dalpahar Iron & Manganese Ore Minse of Sri D.C.Jain
51. Seremda – Bhadrasahi Manganese & Iron Ore minse of M/s Omc Ltd.
52. Panokoili-Remuli section of NH-215 of M/s NHAI
53. Tiringpahar Manganese Minse of M/s Tata Steel Ltd.
54. Joda West Manganese Mines of M/s Tata Steel Ltd.
55. Bamibari Manganese Minse of M/s Tata Steel Ltd.
56. Khondbond Iron & Manganese Mines of M/s Tata Steel Ltd.
57. Rimuli – Rajamunda Section of NH-215
58. Joda Est Iron & Manmora Manganese Minse of M/s Tata Steel Ltd.
59. Dubuna – Sakradihi Manganese & Iron Ore Minse of M/s OMC Ltd.
60. Sirkagutu Iron & Mn. Mines of Prakash Industries Ltd.
61. Laying of water pipeline and other related infrastructure facilities by M/s Essar Steel India Ltd. For operationalization of Iron Ore Beneficiation plant at Dubuna
62. Karakhendra Steel Plant of M/s Rungta Minse Ltd.
63. 20 MW Power Plant within Karakolha Sponge Iron plant of M/s Rungta Minse Ltd.
64. Bolani Ore Minse (6.9 sq. miles) of M/s SAIL
65. Rehabilitation and upgradation of Singaa-Binjabahal section of NH-6
66. Unchabali (Mahaparbat) Iron Ore Mines of OMC Ltd.
67. Construction of 132KV transmission line from 132/33KV OPTCL Grid Station at Barbil to Kamanda Steel Plant of Rungta Minse Ltd. In Sundargarh District
68. Iron & Mn. Mines of Kushaleswar Minera in Keonjhar district

From the above Site Specific Conservation Plan approved by the PCCF (WL) & CWLW, Odisha the following 20 nos. plans whose project impact area overlap with the project impact area of Jajang mines are narrated below.

Those are as follows :

1. M/s R.P. Sao, Guali Iron Ore Mines.
2. M/s Sarojini Pradhan of Baitarani Iron Ore Mines.
3. M/s Sarojini Pradhan of Inganijharan Iron Ore.
4. Jalahuri Iron & Manganese Mines by M/s Mala Roy & others.
5. Inganijharan Iron & Manganese Ore Mines of Bhanja Minerals.
6. Smt. Indrani Patnaik – Unchabali Iron and Manganese Mines in Keonjhar dist.
7. M/s Rungta Mines – Jajang Iron & Manganese Mines.
8. M/s Orissa Mining Corporation Ltd. – Bansapani Iron Ore Mines.
9. M/s Hargovind Pandey & others,Jajang iron & Manganese Mines
10. M/s OMC Ltd- Tiring Pahar Iron Ore Minse
11. Khandabandh Iron Ore Mines by M/s Shree Metalicks
12. Khandabandh Iron Ore Mine by M/s OMC Ltd.
13. Khandabandh Iron Ore Mine of M/s Deepak steel and Power Ltd.
14. Balda Block Iron Ore Mine of M/s Seerajuddin & Co
15. Dalpahar Iron & Manganese Ore Minse of Sri D.C.Jain
16. Tiringpahar Manganese Minse of M/s Tata Steel Ltd.
17. Joda West Manganese Mines of M/s Tata Steel Ltd.
18. Bamibari Manganese Minse of M/s Tata Steel Ltd.
19. Khondbond Iron & Manganese Mines of M/s Tata Steel Ltd.
20. Unchabali (Mahaparbat) Iron Ore Mines of OMC Ltd.

The user agencies has already deposited their respective approved amount in the CAMPA fund. From the fund deposited by them for the interventions to be implemented in the project impact area, major amount have been spent for undertaking different interventions and work for balance amount have been undertaken in the project impact area.

Chapter–III

Probable Impact of the project on flora and fauna:
The mine is on a hilly terrain with elevation ranging from 415 to 411 meters and hillock running south to north. River Baitrani flows on the east of the area, which receives rain water by 3 seasonal streams flowing from the M.L. area, 2 in east and 1 in NE. The M.L. area has open scrub with species like Shorea robusta, Anogeissus latifolia, Largerstromia parviflora, Terminalia tomentosa, Holarrhena antidysenterica, which is an in a degraded stage of dry mixed deciduous forest . The buffer zone has 3 R.F's, viz Baitrani R.F to N&NW, Chamakpur R.F. to NE&E and Siddhamath R.F. to NW. The above 3 R.F's respectively have Dry mixed deciduous, Dry peninsular Sal and Moist peninsular valley Sal for most part with open to moderately dense stands.

The fauna of M.L. area is represented by small animals like palm squirrel, rat, jungle cat and rufus tailed hare , frogs and toads, lizard, chameleon, rock pythan, crow common myna, coucal etc.

The fauna of Zol include barking deer, languour, rhesus monkey, crow, ring dove, jungle fowl, monitor lizard, snakes etc. Sloth bear and Elephants are two endangered animals which use the habitat beyond the buffer zone.

The mining operations involves clearance of vegetation, blasting, excavation by cateoillar excavators, loading of ore to tippers by wheel and pay loaders, transportation to railway siding, movement of vehicles and labour force, dumping of over burden and sub-grade ore, storage of mineral operation of crushing & screning plant , ore benefication plant, pelletisation plant etc.

All the above activities not only distrub the habitat but also bring about significant geomorphologic changes leading to outright destruction of animals which are less mobile and have narrow home ranges while mobile wildlife species are displaced.

IMPACT WITH IN THE LEASE AREA

i) **Habitat Loss**

Habitat loss is the outcome of this habitat destruction in which natural habitat is rendered functionally inert to support the native species of flora and fauna. Plants and animals which evolved with the site and got adapted to various habitat niches become homeless and perish due to shock.

Animals with faculty of large home ranges are displaced. Small animals which manage to stay on witness decline in population due to reduced carrying capacity of the area.

Habitat loss means altered N, P, S and C cycles, loss of carbon sequestration, watershed values, pollution and breaking down of pollutants. Land is rendered infertile. Although the habitat loss is termed as temporary and habitat can be rebuild by reclamation and reforestation, in the medium term, some of the changes e.g. nutrient drain is irreversible and only secondary vegetation can be expected with reforestation and animals adapted to grass-shrub stage will come back to begin with.

ii) **Loss of top soil, erosion:**

For the present, there are 6 O.B. dumps atdifferent locations, 6 mineral stack yards, 'C' block working pit in the southern half & 'B' block working pit in the northern half. In addition, there are 30 small to medium sized pits lying abandoned. Due to unsystematic surface mining in the past for float ore, top soil has been lost at most places. There is threat of soil erosion from dumps, sub-grade mineral stacks, haul roads and land surface in general during rains. Sheet erosion is common. Rill erosion is noticed on the dumps. Soil erosion has an irreversible impact on the nutrient status of the residual soil which can support only degraded vegetation and plants of lower status in the scale of succession. Consequently, the number and variety of animals this can support will be low and that too of such species which have low nutrition requirements.

iii) **Moisture loss**:

One seasonal nala originate from the M.L. area all draining to Baitarani River at the north east side. With the change in landscape configuration and soil loss, there will be moisture loss as well. In short, the watershed function of the area will be lost. There will be less percolation due to clogging of soil pores and change in soil structure and accelerated run off, rendering seasonal nalas to become mere depressions. Lack of moisture keeps the vegetation stunted and excludes the habitat utilization for most part of the year even by smaller animals.

iv) **Water pollution**:

The runoff from the M.L. areas carry red silt with iron and manganese fines and contaminate the streams and the Baitarani River. Such brown red water is due to heavy sediment load iron and Manganese ions are in river water in 3 forms: (i) Insoluble suspended matter which gives the brown red colour: (l) Soluble matter in shape of salts; (iii) Organic iron in form of colloidal compounds. Fortunately, the iron content is within permissible limits and not harmful to animals. However, it imparts a peculiar odor to the water and animals generally avoid its use if alternate choice is available within the home range. The turbidity, however, affects the aquatic life, fish and turtoises by reduction in production of plankton. This is a priority concern, as river Baitarani is just on the eastern boundary of the mine.

v) **Forest fire** :

Forest fire is common in mining belt due to large workforce, transporters and other floating population. Villagers, while collecting fuel wood etc may also accidentally set fire. As the predominant wind direction is SW, the fire may come from residential area of the mine or from the mines situated on the northern side. Plantations will be raised in the mine area during the plan period. The plantations will be severely damaged and small animals sheltered within this cover will also be charred to death. Fires leave the trees injured and stressed, which remain susceptible to further attack by fungi and insects. Non establishment of plantation defeats the purpose of reclamation and safety zone.

vi) **Accidental fall of animals in pits :**

Existing quarries are 'B' DIOCK1230 x 360m and "C' block 1040 x 280m. Their working depths are 70m and 87m respectively. Such deep mining pits are dangerous to wild animals of migratory nature, which may not have mental cognition of the changed geo-morphology. Any accidental fall for such unsuspecting animals could be fatal.

vii) **Pollution of the habitat :**

Pollution is an undesirable change in the physical, chemical or biological characteristics of air, land and water that may or will affect living conditions or life on earth. Pollutants are residues of things we produce, use or throw away. The extent of pollution is directly proportional to our demands on natural resources which are continuously on rise. In the mining scenario, we mainly have dust pollution, noise pollution and vibration, water pollution and light pollution.

viii) **Dust pollution**:

The ill effects depends on size of particles, concentration of particles, chemical nature of particles and substratum on which it is deposited. The latter includes vegetation type, leaf surface, surface roughness and wetness and predominant wind direction. Physical effects on plants may be blockage and damage to leaf stomata, shading from sunlight leading to reduced photosynthesis, reduced rates of growth and plant vigour. Regeneration of forest is affected by reduced seeding. Reduced plant vigour means susceptibility to fungal and insect attack. Dust acts negatively on the useful roles played by predators of defoliators, sap suckers and borers. Huge clouds of dust disrupt normal living conditions of wild animals. It affects the wild habitat, food and drinking water resources. Dust triggers aggressive immune responses in animals, which may cause damage to lungs. As a balancing act to stress, the heart rate may increase, curtailing the activity cycle. Dust can also carry bacterial, fungal or viral pathogens and make the stressed animals vulnerable to disease.

ix) **Noise pollution**:

Noise from working machines and men could result in hearing loss, if the noise levels are 85 db or higher. Noise may mask animal signals like alarm call, mating call or call of a predator and impinge survival or reproduction. Noise is a stressor which may result in animals abandoning the site to a safer location. Constant rumble of machineries and tippers may mask the down chorus of birds, particularly of males calling females upsetting courtship, breeding and hence population structure. Constant exposure to noise may lead to weak immunity and affect hormonal levels, hampering body function.

x) **Road development and traffic related disturbance:**

There are 3 arterial roads, one leading from B.P. No. 31 & 30 on the western corner from Joda to Bamebari in west and going on NW border to B.P. No 21A on the north, two running southwards from B.P. No. 21A to B.P. No. 48 and third, going northwards from B.P. No.48 to Jajang railway siding. There are several approach roads to mine pits, dumps and screening plants: The entire road length is 16 km. Besides there is a Village road from B.P. 11 to B.P. 21 on the north & north east of the mine from which a road is proposed to the pelletisation plant. There are 27 dumpers of 35t capacity in the mine. For both O.B. and ore transport, 612 trips will be made in two shifts up and down. For 12 hours working, this works out to 51 trips/hour or almost 1 dumper every minute on the road over 3 km. This is considerable disturbance to the habitat. Further road construction will add to the disturbance and fragment the habitat. A Road accident of small and sluggish animals is a strong possibility.

xi) **D.K.B. Railway Line :**

Railway line from Banspani to Nayagarh runs in an arch on the northern, central, eastern & south-eastern side of the M.L. area from B.P. No. 21-5-52 dividing the area into two parts. This is a potential threat to wild animals choosing to cross the line and go to Baitarani river. Accidents may happen.

xii) **Littering of the site:**

About 400 people will work in the mine area including labourers engaged by various contractors while leftover food may attract animals like hyena, jungle cat, crow, kites and monitor lizards, ingestion of wrappers, particularly polythene and cellophane material may choke their alimentary canal. The mine camp will also generate domestic waste from residential houses. Littering offends everybody, aesthetically unpleasant and hazardous to health also. Piles of fitter also emit offensive smell due to fermentation of biodegradable waste.

IMPACT WITH IN PROJECT IMPACT AREA

i) **Fragmentation of habitat:**

Due to mosaic of mines, habitations and agriculture, forest connectivity between Chamakpur, Baitarani and Siddhamath is drastically affected. One important source of water is Baitarani River but most animals are prevented to make use of the river water due to cluster of mines on its west bank and further beyond. Fragmentation of the habitat has affected movement pattern of elephants. Fragmentation may make the forests vulnerable to loss of species and disappearance of genetic diversity within the species by isolating populations of several animals, creating conditions for inbreeding and paving the way for extinction.

ii) **Forest degradation & habitat loss:**

Forest is degraded as more and more mines open up and break forest land. The combined effect of illicit felling by work force, floating population, forest fire, dust, smoke, erosion, nutrient drain and warming of the locality due to pollution contribute to forest degradation. The species are lost at an accelerated rate. Those that persist do not regenerate. The vigour of the plant growth is lost. The food and cover value of the habitat is lost. Thus a natural forest habitat is rendered functionally weak to support animal species. The situation in remote forest areas, where anthropogenic and mine stressors are minimal, due to congregation of animals displaced from mine habitat, stiff competition for available resources and space ensues. Due to over grazing and browsing, the carrying capacity of the habitat is reduced. Reduced carrying capacity of the remote forest means decline in population and ultimate extinction. In short, habitat loss is the loss of bio-regenerative capacity of the natural system.

iii) **Loss of biodiversity:**

Biodiversity is variability in species, phenotypicand genotypic, species richness and diversity in population, community structure and ecosystems. Biodiversity is disappearing because of direct drivers like rapid change in land use and land cover, fragmentation, over exploitation of plants, poaching of animals, pollution, and habitat loss and over all climate change. Indirect drivers are population growth or population intrusion, economic activity (mining & industries) and technological advancement. High biodiversity signifies maturity of the ecosystem, where stability against external disturbance and nutrient conservation is good. In such a system, food chains are web like, stratification and spatial heterogeneity is well organized. The latter two give rise to high degree of niche specialization, meaning very narrow food and micro habitat requirements. Such specialist plants and animals are first victims of extinction e.g. Sáraca ashoka of stream banks and fish life, which become vulnerable to loss of perenniality, pollution with sediment and opening of canopy. Loss of species is an irreversible loss because this cannot be recreated with application of technology. When

several species are lost, ecosystem resilience is impaired, food & cover values are cut of drastically and area is rendered unproductive.

iv) **Forest fire:**

Forest fires are common in tropical forests. However, inmining belt, its impact is significant as the forest ecosystem is already stressed due to large work force, honey combing of forest and pollution. Forest fires, not only burns leaf litter, it consumes humus, useful micro flora and fauna in soil, make the soil caked and hardened. A chain reaction ensues loss of soil by accelerated run off, retarded sub-soil seepage, nutrient drain, annihilation of seeds, seedlings and delayed or absence of regeneration. Although a few grass species, usually annuals and fire hardy ones come up as a result of fire, but this happens at the cost of several browsable undergrowth. The net result is loss of food and cover to several species of wild animals. Direct impact is charting away of young of animals having no faculty to escape, eggs of ground nesting birds and slow moving pythons and lizards. Repeated fires scorch the bark of many trees and making the trees diseased and vulnerable to fungal and insect attack. Fire displaces many birds as well from their nests in the high branches or burrows in trunk. Fire also affects the habitat utilization pattern at least temporarily. Lot of dead insects is made available on the ground for insectivorous birds but many useful insects are also lost. Forest fires generate lot of green house gases as well as warming up the environment.

v) **Absence of clean water:**

Baitarani River flows from south to north inthe middle of the buffer zone forming one boundary of the mine. Kundra nala on NE, Jalpa nala on south and Kakarpani nala on west are other nalas, which are more or less perennial. There are some 50 mines in the catchments of these rivers/nalas within the Zol. The flowing water is highly turbid with sediment load washed out from themines. As such, there is lack of clean water for animals.

vi) **Probable increse int the vehicular traffics and its impact:**

Some 1000 trucks transport ores to buyer's destination directly or to railway siding at Banshpani, Barbil, Bamebari Camp - Joda route passes through area. As such, there is continuous disturbance to the habitat from the heavy traffic. Free movement of animals during night is affected due to constant flashing of head lights. Traffic jam, further aggravates the problem and makes an impenetrable barrier on the road. This also contributes to dust pollution.

NOISE POLLUTION, WATER, AIR AND UNDERGROUND POLLUTIONS ETC.AND ITS PROBABLE IMPACT ON FLORA.

vii) **Air pollution:**

Air pollution has synergic effect in that hydrocarbonsreleased from diesel vehicles combine with other pollutants in atmosphere to produce more pollutants. Hydro carbons combine with Nitrogen oxides in ultra violet radiation to release Peroxy Acetyl Nitrate (PAN) and ozone. PAN is quite toxic and known as "photo chemical smog" which kills plant by interfering with photosynthesis. Ozone increases respiration of leaves, thus, killing the plant by depletion of its food reserves. Depletion of plant life negatively impacts animal life.

Direct effect of smog is respiratory distress in animals.

viii) **Noise pollution:**

Noise from working machines and men could result in hearing loss, if the noise levels are 85 db or higher. Noise may mask animal signals like alarm call, mating call or call of a predator and impinge survival or reproduction. Noise is a stressor which may result in animals abandoning the site to a safer location. Constant rumble of machineries and tippers may mask the down chorus of birds, particularly of males calling females upsetting courtship, breeding and hence population structure. Constant exposure to noise may lead to weak immunity and affect hormonal levels, hampering body function.

ix) **Water pollution:**

The runoff from the M.L. areas carry red silt with iron and manganese fines and contaminate the streams and the Baitarani River. Such brown red water is due to heavy sediment load. Iron and Manganese ions are in river water in 3 forms: (i) Insoluble suspended matter which gives the brown red colour: (l) Soluble matter in shape of salts; (iii) Organic iron in form of colloidal compounds. Fortunately, the iron content is within permissible limits and not harmful to animals. However, it imparts a peculiar odor to the water and animals generally avoid its use if alternate choice is available within the home range. The turbidity, however, affects the aquatic life, fish and turtoises by reduction in production of plankton. This is a priority concern, as river Baitarani is just on the eastern boundary of the mine.

x) **Depredation of wild animals:**

Karo-Karampada interstate elephant corridor is not within the Zol and about 18.5 km away. However, elephants use Siddhamath, Uliburu and to some extent Baitarani R.F. to the west of the mine. Movement of elephants in a disturbed and fragmented habitat results in deflected movement patterns and brings them close to habitation. They get aggressive when their habitat is destroyed movement routes blocked and access to preferred food resources

(standing paddy crop) is denied. As local people consume country brew in weekly hats, a social congregation site of tribal and get intoxicated, they are unable to avoid approaching elephants and flee from the scene. One to two human casualties take place every year. Elephants also damage houses, when they are prevented to feast on mangoes and jack fruit grown in village lands. Sloth bear attack onhumans has been reported during February-April during Mahul flower season, when bears are active feasting on the flowers.

ARTIFACTS WITHIN THE FOREST LANDSCAPE:

a) **Rallway:**

D.K.B. Railway link is almost 80% complete, except signaling, earth work at some stretches and major bridges. The link passes in the middle of the Zol from north to south. Construction related disturbance apart, when the line will be fully operational, it will stand as a potential danger to wildlife, elephants in particular, crossing the track.

b) **Power line:**

Besides the main power line that runs between Malda and Joda within the Zol, there are several other 11 KV distribution lines within the area connecting various mines. These lines, due to improper maintenance may sag endangering the lives of elephants through electrocution.

c) **Problem of road crossings for mega fauna like Elephant :**

As narrated above Malda-Joda State Highway passes in the impact area from south to north bordering the lease area & dividing the wildlife habitats at some points. Therefore, elephants while crossing the road during crop season may face road accident due to movement of heavy vehicles & those shall be other man-animal conflicts. This may be a potential danger in the buffer area.

As there is no movement of mega fauna inside the project area, hence there shall be no impact on the movement of mega fauna if the project is implemented. However there are cluster of mines human habitations, cultivated lands, occurring the impact area there shall be impact on the movement.

Chapter-IV

Mitigation measures required.

PROJECT AREA :
Due to operation of various mining activities, the Wild life present within the lease area will be threatened. Besides the Wild-life habitat is reduced to the extent of forest area involved in the project. The Wildlife Management Plan (Site Specific Conservation Plan) therefore aims at providing safe passage to the existing wild animals from the lease area to the nearby Forest areas and improving the habitat in the surrounding areas. Certain measures are also required to be taken with in the mining area.

The proposed measures can be taken within the project area by the project proponent and beyond the lease area by the Government (Forest Department) with the financial support provided by the user agency.

Based on the perceived threats to wildlife as per the foregoing chapter, the Management Plan is prepared to address almost all such threats. The lease hold area as well as the Impact area and beyond will be treated for habitat improvement so that, more fodder and water will be available for the wild animals.

The life of the mine has been estimated to be 50 years for extractiong of Iron ore.

Interventions inside project area :
The activities taken up in the project area will pose maximum threat to wildlife. It is therefore necessary to minimise such threat. The following steps will be taken within the lease area.

i) **Safe passage to Existing Wildlife**

It is very important to save the existing wild animals available within the lease area and to divert them to safer locations. It can be possible to achieve such objective by commencing the mining activities from locations situated away from the Forest areas. Thereby the medium and large Wild animals present within the Lease area will find their way to nearby Forest areas.

ii) **Restoration of habitat**

Within the lease area it will be broken up for the purpose of Mining. It is therefore not practicable to restore the Wild-life habitat in this area until the Mining activities are completed. However, as per approved Mining Plan/Environmental Management Plan the mined out pits shall be reclaimed gradually and plantations of indigenous fodder and fruit bearing species shall be planted to bring back the original ecosystem.

iii) **Solid Waste (Overburden) Management**

Top soil generated during the mining period, shall be stored temporarily over the designated location. Arrangements for watering the top soil dump through internal perforated pipes shall be made to maintain moisture level in the soil.

All the overburden dumps shall be reclaimed technically and biologically completely as soon as the dumps are declared dead. However, the dump slopes shall be periodically sprinkled with water and plantation shall be carried out over the slopes. Garland drains and toe walls shall be constructed all along the dumping area in order to check the surface run off. These garland drains shall be routed through settling tank where the suspended solid shall settle down and the decanted water shall be used in the beneficiation plant. Iron ore shall also be stabilized by afforestation over dump slopes in the next five years.

During the operation period of mining activity, several first order streams which flows from the top of the hill gets disturbed due to the hill cutting. Re-establishment of directional flow in the streams are important not only because the streams are surface recharge sources for adjoining nalas but also to regulate water flow in the disturbed area in a systematic manner. Long drainage channel shall be constructed along the quarry and dumping areas connected to settling ponds in order to arrest the suspended soild and then finally shall be discharged to the nearby water body. The drainage channels should be of adequate size to meet the load of monsoon run off.

Dump area (overburden & sub grade ore) of 39.146 ha will be gradually planted up with grasses and other suitable species as per dump stabilization provisions. The comprehensive habitat restoration of the lease area will be as follows:

iv) **Steps to prevent fall of animals in the mining pits.**

In order to prevent accidental fall of animals in the mine pits the following steps shall be taken.

The periphery of the mine lease area will be around 2 kms. It is proposed to erect and maintain solar electric fencing around the entire area to prevent entry of large and medium animals and maintain the same during the plan period.

However small animals like Squirrel, Mongoose etc, and Reptiles may enter in to the area. The working labourers and staff will be educated to protect these animals and divert them towards the forest area.

In-spite of the precautions taken, in case of accidental fall of any wild animal in to the mine pit, the workers will be educated to inform the local forest authorities and act as per their advice.

v) Provision for **graded bund** all along the boundary of the lease area wherever necessary to allow the surface runoff from the lease area to percolate in to ground instead of flowing in to adjoining villages, corn fields & other wild life habitats as a soil & conservation measure.

vi) **Provision of hired vehicle for Rapid Response Team:**

It is proposed to make a hired vehicle available to the DFO for movement of Rapid Response Team. The proposed expenditure shall be Rs. 51.40 lakhs (Hiring charges of vehicle 37.2 lakhs + POL etc. 14.2 lakhs) for ten years plan period as per approved cost norms of PCCF (WL) & CC, Odisha.

vii) **Health Camps and Cattle Immunization:**

Health camps and Cattle immunization camps will be organized in the forest fringe villages to get pro-active support for wildlife protection. An amount of Rs.10.00 lakhs (Rs. 5.0 lakhs for cattle emulization camp + Rs. 5.0 lakhs for helth camp) is proposed during the plan period.

viii) **Provision for use of drones fitted with cameras for monitoring of wild animal and main animal conflict:**

Payment to the expert agency will be made by JSW Steel Ltd. subject to demand note with account details and direction received from the DFO, Keonjhar.

ix) Provision for rechargeable large long range powerful flashlight/torch to be distributed among villagers for assisiting the protection force. 10 nos. to each village for 20 villages = 200 nos. @ Rs. 1000/- per each = Rs. 2.00 lakhs.

x) Supply 10 units of high frequency ultra-sonic Sound elephant repellents to Keonjhar Forest Division @ Rs. 40,000 each frequency and cost of maintenance Rs. 12,000/- per year to disallow movement of elephants to the villages and corn fields to be installed in strategic locations.

xi) Establishing Bulk messaging System for immediate message spreading from field to all grass-root level forest Officials, ROs, ACFs & D.F.O., Keonjhar including the maintenance cost of Rs. 4,000 per year over the plan period

xii) Purchase and supply of android based Mobile handset for quick message transmitting and immediate communication amoung the field staff to control man-animal conflict in the field.

xiii) **Mitigative Measures During mining operations as per approved Environmental Plan.**

Activities	Impact	Control Measures
Mining Operation	NO2 emissions in the mine mainly occur during blasting operations	• Use of good quality explosives having proper oxygen balance with regular monitoring; • Regular updating of the date of manufacture/expiry to avoid confusions. A normal procedure is in place to check/visually inspect all explosives, and if disintegrated ingredients are spotted, the explosives is not used, even if the date has not expired; and • The primer to column ratio is also rationalized so as to produce minimum NO2.
Transportation of Ore	The mining will be carried out by fully mechanized open cast method using drilling and blasting by deploying HEMM equipment's like hydraulic drills and excavators, wheel loaders, dumpers.	• The high-grade iron ore lumps extracted from the mine will be transported to JSW Steel Plants through railway/port/road and the low-grade ore of Nuagaon, Narayanposhi, Gonua, Jajang & upcoming mines/merchant mines will be beneficiated in the proposed 30 MTPA Grinding & desliming/beneficiation plant to improve the Fe content of the ore. • Post grinding/beneficiation, iron ore of all JSW mine will be transported through slurry transportation system to end use plant through slurry pipeline.
Ore Loading	Ore after crushing & screening is sent to stockyard. Lumps and fine ores are stacked separately. Water sprinkling arrangements have been provided so that there will not pollution.	Transportation of Ore by covered Trucks to nearest railway siding. No over loading.

Activities	Impact	Control Measures
Air Pollution	Drilling Blasting Excavation Ore/OB loading, transportation & unloading Movement of heavy earth moving machinery Wind erosion of exposed mine surface, ore stack & OB dumps	• Proper and proportionate mixing of fuel oil with ammonium nitrate to ensure complete detonation; • Use of adequate booster/primer; and • Proper stemming of the blast hole. • Dust suppression system in the form of water jets installed in all the drill machines for reduction in dust generation during drilling; • Fixed and mobile water sprinklers to suppress dust during hauling; • Dry fog systems in processing plants for dust suppression; and • Coir matting using geo-jute in dumps with plantations. • Installation of pulse jet bag filter at primary crusher of processing plant; • Cylindrical bags made of polyester with antistatic property are used as a filter medium inside bag house; and • Cleaning is controlled automatically by a sequence controller. • Regular maintenance of vehicles and machinery is being carried in order to control emission; • AC cabins for shovel and dumper provided which leads to minimum exposure of the operator to the external environment; • • Dust suppression on exposed area is being done using water trucks and sprinkler provided on the approach to mine, beneficiation plant; • Dust generated due to traffic on haul roads are reduced by water spraying at regular interval of time. Further, no. of pressurized water tanker to be added in the fleet to strengthen the mitigation measures; • Greenbelt development is being developed all along the haul roads and overburden dumps which is going to be enhanced further; • A good housekeeping and proper maintenance practice will be further helping in controlling pollution; • Dust generation due to ore processing at beneficiation plant is controlled by providing dust extraction system at hopper area, dry fog system at all transfer points, network of conveyors, minimize spillage by better management of conveyor system and housekeeping. Further, wind broken wall has been envisaged near the crusher for dry ore to avoid the particles to fly.

AIR POLLUTION CONTROL MEASURES

xiv) **Mitigating impact on noise environment.**

With the mining operations, due to the deployment of machinery, drilling and blasting for mine development, excavation, transportation and crushing of iron ore and men, it is imperative that noise levels would increase. However, as the mine lease boundary is located 0.5 km away from the nearest settlement, the expected noise levels will not have significant effect on the community.

Mitigating impact due to Noise Pollution

Activities	Impact	Control Measures
Noise Environment	• Due to Drilling • Due to Blasting • Due to Excavation & Transportation • Due to Crushing, Screening & Loading Plant • Dispersion from Mine	• Minimum quantity of detonating fuse is consumed by using alternatively excel non-electrical initiation system; • The prime movers/diesel engines are of proper designed and been properly maintained; • The operator chambers are safe guarded with proper enclosures to reduce the noise levels; and • A thick greenbelt has been provided and further to be taken up in phased manner around the periphery of the mine to attenuate noise and massive plantation in and around lease area. • Provision of protective device like ear muffs/ear plugs; • Provision of sound insulated chamber for the workers deployed on machines producing higher level of noise like bulldozer, drills etc.; and • Reducing the exposure time of workers to the higher noise levels.

NOISE POLLUTION CONTROL MEASURES

WET DRILLING AND DUST EXTRACTOR SYSTEM IN DRILLING OPERATION

xv) **Mitigative measures for water environment protection.**

Activities	Impact	Control Measures
Water Environment	• The working mine will encounter the water mainly due to rainfall. As mining activities are carried out in hilly topography the rain water flow will be directed by natural slope of the area and will not cause any inundation of the mining area .The nature topography will facility a proper drainage system in the mine. • Impact on Water Resources Due to Mining Operations • Surface Water Resources • Ground Water Resources	• Tailings generated from processing is diverted to High Rate Thickener [HRT] where suspended solids settle down and decanted water is recycled back for re-use in process; • Hydro-cyclone: to recover Fe from slime and slurry, increase life of thickener and increase quality of water; • Treated ETP & STP water used in process & plantation; an • The surface run-off is been collected & used during rainy season, which conserves the fresh water resources. • The mine sump itself acts as good rain water harvesting pond. Sump is crated at the bottom of the working pit and the rainfall directly falling in the mine area is drained towards the sump in the bottom of the mine pit for harvesting it; • Construction of settling pond/percolation pond at various strategic locations across the mine; • Rain water harvesting from roof tops of buildings and other super structures for storage. The roof top rain water is collected and channelized to the recharge well; • Suitable storm water drainage system along the roads is provided to dispose storm water effectively. The surface run-off collected in the storm water

		drains are channelized through a series of settling-cum-percolation ponds before discharged; and • Staggered trenches are proposed to be constructed along the contours so that during sudden storm, good amount of run-off can be harvested which will maintain a good amount of soil moisture content.

xvi) **Mitigating impacts on Flora and Fauna**

Activities	Impact	Control Measures
Biological Environment	The project spread over an area of 669.078 Ha. has 543.916 Ha of forest area and 125.162 Ha. of non-forest area. **Impact on Flora:** In the existing and proposed mining operations, NOx emissions are mainly due to burning of diesel in mining vehicles. However, the low concentrations of NOx due to operation of the proposed mining operations will have insignificant impact on ambient air quality and NOx concentration will remain within the NAAQ standards. Therefore, the impact of these emissions on the surrounding agro-ecosystem is not envisaged. Extensive plantation comprising of pollutant resistant trees is being carried out surrounding the mine site, which will serve not only as pollution sink but also as a noise barrier. It is expected that with the adoption of these mitigatory measures, the impact due to operation of the will be minimal on the terrestrial ecosystem. **Impact on Fauna:** The adverse impacts on fauna would be mainly due to:	• Enhancement of Green belt development/afforestation will increase flora • Green cover will attract fauna due to plantation of edible trees. • Plants suggested for afforestation and reclamation of back-filled areas. • To broadcast the seeds of fodder legumes such as Hamata (Stylosanthese hamata), Wild Mung gram (Phaseolus trilobus), Yellow Peanut (Arachis pintoi) and non-palatable nitrogen fixing legumes like Sesbania rosrata, Sesbania aculeata and others for bio-remediation and soil reclamation before undertaking any transplantation. They may be grown for one or two seasons to modify and enrich the mineral soil. • • Part from routine transplantation, seeds of Sal, Mahua, Tamarind, Neem, Karanj may be pelletized with well decomposed organic manure mixed with clay and sown in high density at the rate of one for every square meter before the beginning of monsoon. Some of them are

	• Human activity; • Noise; • Land degradation; and • Deforestation. The impact on the fauna of the buffer zone due to the mining activity will be marginal. The fauna is less in occurrence in the study area. Even so, by restricting mining at any time to small areas, impact on fauna will be kept to the minimum. Moreover, progressive plantation with over a period of time will create conditions favourable for fauna.	likely to grow in to big trees over a period of time. • Local mango varieties may be gown in large numbers by directly sowing the seeds. • Where there are large gaps, big shoots of bayan with aerial roots (prop roots) may be directly transplanted to ensure that they can rapidly cover the gaps. • As far as possible to give greater importance to native forest species and saplings of such plants may be procured from the social forest nurseries. • The Jajang mine is also advised to liberally apply compost, vermin-compost and farmyard manure in pits before transplantation of saplings. Biodiversity Conservation Initiatives: • Development of butterfly park; • Artificial niche nesting; • Development of medicinal garden; and • Nursery for development of native species.

xvii) **Relevant Provisions of proposed EMP for the project & the interventions over lapping in nature to be specified.**

The impact of the project on environment and the mitigation measures have been dealt in detail under chapter-4 of the Environmental Impact Assessment and Environmental Management Plan which is in draft condition & those are furnished below:

a) **<u>Impact on Land use and Topography</u>**

The Baitarani river flows outside the lease area on eastern side. The eastern side is drained by small nallas which meet with Baitarani river. The ridges and river channels are NW-SE trend. All the major perennial water courses flow towards NW and east. The water divide between the sub water sheds (Kundra & Baitarani) also trends NW-SE. It is evident that water divides that only sub water shed of Baitarani river on the left in relevant to core zone.

The mining was operating since 1957 by previous lessee. The present land use is already under industrial mining purpose. The following changes to land use will occur due to proposed activities. The existing measures which were carried out by the previous lessee will be further strengthened.

- Removal of topsoil;
- Removal of Overburden (OB);
- Dumping of OB; and
- Formation of garland drains around the working pit and OB dump.

Mitigation Measures

Haul Road

The rain water during monsoon season is being controlled by suitably provided cross slopes of about 1% for the benches. While preparing and advancing the benches, main road and other ancillary roads, suitable slope and drainage are being maintained so as to avoid unwanted accumulation of water.

The drainage on the main road is kept towards hill side and roads are given 1% slope towards drainage. So that the water is not accumulated on the roads, the drain width is kept about 1m.

Mine Benches

On the benches, 1°slope is kept away from the face and joining to drainage of the roads so that water is not accumulated on the face.

Discharge to Perennial Nallahs

No wastewater will be discharged from the proposed beneficiation activities. Zero discharge will be maintained in the proposed plant facilities. However, for mining during monsoon season, run-off water from mine is collected in the silt settling ponds created at the lowest bench of the mine where silt get arrested. The overflow rainwater is routed into the low-lying areas through existing check dams &check bunds. The check dams &check bunds are de-silted well before monsoon season every year to ensure clear water to overflow. The de-silted material is stacked separately.

The surface run-off from the external OB dumps is guided through sedimentation ponds and garland drains to the surface water course. These structures remain even after the closure of the mine as it will prevent eroded material from reaching the main drainage/water course of the region.

OB dumps are terraced properly and in addition a buttress wall of sufficient height & width was constructed a few meters distance from foot of the dump in order to avoid the surface run-off.

However, by upgrading the existing mitigation measures, scientificway of mining and better management technique during course of mining activities like stabilization of dumps with plantation, toe wall, garland drains, settling pits, check dams reclamation of the mined-out land and OB dump.

b) **Imapact on climatic conditions**

The climate condition including temperature variations, wind direction and speed, rainfall and humidity are governed by regional factors and the monsoons. As such the mining and other allied activities will not tend to influence the climate. Further, carbon dioxide (green-house gas) emissions due to fossil fuel in the form of diesel to operate the trucks and earth moving machinery is quite obvious but it is a necessity and hardly pose any adverse impact on climate.

Hence, the mining operations are not likely to cause any adverse impacts on the local climatic conditions.

Mitigation Measures

The operations are being carried out in a limited area and hence negligible climatological impacts are anticipated. Implementation of afforestation and existing rehabilitated plantation work in ML area are beneficial to the climatic conditions.

During the ensuing plan period, it has been envisaged to make the production of 12.80 MTPA (ROM) from B-block and C-block quarries since these blocks were already developed and open having mineable reserve which can meet plant requirements. Both lateral and depth ward development has been proposed to be undertaken to achieve the targeted production.

Land degradation is one of the major outcomes of mining activities and any effort to control adverse impacts is considered incomplete when appropriate land reclamation strategy is not adopted. Since the land degradation in this mine is partially in the form of excavated void and partially in the form of internal dumps, the reclamation strategy also included the program for reclamation of the disturbed land.

Since the mining activities are limited to only core zone, there will not be any adverse impacts of land in the study area.

c) **Mined Area Reclamation**

About 44.62 ha area is backfilled within the lease area in 5 locations, out of which 2 are in B- Block and 3 are in C- Block. During the plan period an area of 49.60 Ha will be backfilled. Thus the total backfilling area at the end of plan period will be 67.18 ha. It has been planned to reclaim the mined out area by back-filling and plantation/re-grassing.

Reclamation Programme

Utilization of waste:
During the conceptual period total backfilling area will be 87.14 Ha. About 55.33 MT of waste will be generated during plan period and which will be backfilled in 22.56 ha. The backfilling proposed is simultaneous backfilling i.e. backfilling will be undertaken once the area is mined and devoid of ore. The area selected for backfilling will be the extension of the already backfilled area B2 in B-Block.

During the year 2021-22, the backfilling is proposed in between Section N 2800 to 3100 after exhausting the left out ore in part of the section between coordinates N 2426600 to 2427000; E 337600 to 338000, which will extension of the B2 backfilled stages. During the year 2022-23, the backfilled stages of the previous year (2021-22) will be extended in the southern direction, between Section N 2600 to 3000 after exhausting the left out ore in part of the section between coordinates N 2426600 to 2427000 ; E 337600 to 338000 and between sections N1300 to N1600; coordinates Northing N2425000 to 2425800 & Easting E 337200 to 338000 During the year 2034-24, the backfilling is proposed to be carried out over the backfilled stages of the previous years (2021-23) in between Section N 2500 to 3200, between coordinates N 2426600 to 2427000 ; E 337600 to 338000. In the final year 2024-25, it proposed to extend the backfilled stages of the previous years in the southern direction from Section N 2200 to 2800, between coordinates N 2426200 to 242700; E 337200 to 338000. The developments plan are shown in Figure-2.3.

Back-filling details during conceptual period
JSW has planned to reclaim the mined out area by back-filling and plantation/re-grassing in the conceptual period.Concurrent reclamation will be carried out depending upon the exhaust of mineral phase by phase. Out of the total mine area of 275.591 ha, an area of about 94.24 Ha will be covered with plantation/re-grassing after backfilling and 171.641 Ha by bench plantation/re-grassing and 9.71 Ha with water reservoir.

Bench Plantation/re-grassing:
The drilling of the new 57 bore holes till date have augmented the resources thereby increasing the life of the mine. The addition of resources has aided in

enabling production up to the end of this plan period and additional 72 Nos of bore holes are proposed in the plan period, there is potential to increase the resources, Thus, bench plantation/re-grassing will not be possible during this period and shall be taken up in the conceptual period in the areas devoid of ore.

The grass seeding was proposed along the slope of terrace of waste dump and bench slope for preservation of top soil during the process of reclamation and rehabilitation at conceptual period. The grass shall be fresh free from weed and rank vegetation but leaving rhizome with sufficient nodes. Other soil forming local grasses like *dichathiumannultum,cenchrusciliariis* and *panniciumrepones* (lemon grass) vertiver grass, elephant grass, *citrella A, baughanvilla,* would also be used to the above grass.

The target for survival is >70% and budget for afforestation including development of sapling, plantation and maintenance is expected to be around Rs.1,000/- per sapling. This will be spent from the revenue budget.

d) **Topsoil Management**

If any top soil encountered during excavation of fresh areas will be simultaneously utilized for the afforestation and plantation activity.

e) ***Existing Mitigation Measures***

Adopting suitable, site-specific mitigation measures can reduce the degree of impact of mining on land. Some of the land-related mitigation measures are as follows:

- Implementing adequate protection and conservation plan to conserve top soil.
- During the planning stage, identification of waste storage yard and topsoil being done based on slope and run-off characteristics;
- In-pit dumping of mine waste is promoted wherever possible rather than external dumping. In case of external dumping, proper care is taking for stabilization, by suitable plantations.

f) **Soil Conservation Measures**

The following control measures to prevent soil erosion and wash-off from freshly excavated benches and dumps will be adopted :

- Garland drains will be provided around the mine wherever required to arrest any soil from the mine area being carried away by the rain water; and
- The inactive dump slopes areprovided with bushes, grass, shrubs and trees to prevent soil erosion after applying top soil.

After exhaustion of the total workable iron ore reserves, within the lease area, the changed land forms will be subjected to post-mining reclamation activities, for best possible land uses.

g) **Beneficiation plant:**

As far as Beneficiation plant is concerned, finer rejects in the form of filter cake from filter press will be generated. Waste to be generate from the beneficiation plant and it isproposed to dump at exhausted pits. These rejects will be separatelycollected and directly transferred into mine waste dump yard (temporary) and subsequently, backfilled in the mined out void. In case, the reject contains some mineral value, it willseparately stack and used.

h) **Management of OB Dumps.**

The OB dumps will be reclaimed to greencover. OB dump height and slope are based on slope stability studies; maximum 45° angle as the ultimate slope has been provided in the design. Dumps would be made from top down by end tipping method. The environmental impact shall be on account of dump slope failure resulting in dump collapsing, erosion, dust carryover by wind and siltation of surrounding streams.

- Provision of garland drains all around the dump base are made. A retaining wall is erected around the periphery of the dump to arrest the washed fines. The top of dump as well as slope surface is vegetated for stability. This would prevent erosion as well as dust generation. The overall ultimate slope of dumps maintained at 45°.
- The dumps are provided with all necessary protective features such as toe wall, garland drains and settling tank etc. The terrace angle is maintained in the dump so that it remains less than 37.5°. Afforestation on the dump slopes arebeing done for stabilizing the dump slopes, once a part of the dump slope becomes inactive.
- The terraces are designed so that rainwater is drained out of the dump and there is no accumulation of rain water. The rain water gets channelized to the toe wall and garland drain provided at the base of the dump.
- The waste generated is used for bench floor leveling, maintenance of haul roads & berms, making ramps & haul roads during the plan period and remaining quantity of waste is initially be dumped in the existing and proposed waste dumps.

Stacking of Ore:

The ROM ore shall be beneficiated in processing plants. hence it is envisaged that the ROM ore shall be stacked near the processing plants to ensure the utilization of shovel & dumpers in case of breakdown of plants. These stocks shall also act as a buffer in case of less availability of excavators or dumpers in the mine, in which case the ore will be directly fed from these stocks.

The sub-grade is stacked separately at the earmarked place. Waste rocks encountered during the course of mining are handled separately and used for bench floor leveling, making berms etc. The ore is transported from different mining faces in a pre-determined proportion (for blending different qualities of ore) and deliver the same to the processing plant.

i) **Disposal Method of Tailings/Reject**

Detailed tailing filtration study was carried out by M/s Outotech, Bangalore & based on the tests conducted Outotec Larox FFP method is recommended for filtrationof slurry.

In filtration stage slurry recirculation valve is closed and slurry inlet valve opened; the slurry flows into the chamber(see brown arrow in the Figure-4.2).In pressing stage the air booster will start pumping the air behind the diaphragm(see blue Arrow in Figure-4.2). The pressing pressure is adjusted to desired level with the pressingair regulator.In air drying stage the air goes in from the membrane side and flows through the cake and comesout from the filtrate side(see blue arrow in figure above far right).

Tailings will be used as mineral reject by installation of filter press which is a fully automatic process, which produces a cake for easy handling and transport, the system is ideal for convenient disposal of tailings. Hence, no tailing dam shall be constructed for the beneficiation plant.

Impact on Air Quality- Mitigation Measures

Opencast mining operations with beneficiation plant contribute towards air pollution in two ways: addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NOx, SO_2 and CO. The sources of pollutants from the mining activity include:

- Operation of Heavy Earth Moving Machinery (HEMM) which mostly run on diesel;
- Excavation;
- Loading /unloading operations;
- Transportation of ore/overburden in dumpers; and
- Ripping, drilling, blasting, crushing and beneficiation operations.

Air pollution sources at the mining site can be classified into three categories, viz., area sources, line sources and instantaneous point sources. Extraction of iron ore by various activities in mining area is considered as an area source. Transportation of ore from mining area to the storage area is considered as line source. Drilling is considered as point source.

PM and NO_2 emissions are envisaged during blasting and transportation operations. But these will be kept under control by monitoring regularly, the emissions from exhaust and by sprinkling of water on haul roads etc.

Even though blasting generates NO_2, it will be instantaneous and intermittent. Also, NO_2 emission from the vehicular movement on surface would be intermittent and get dispersed quickly.

j) **Overall Impact due to the Mining Activity**

As discussed above, there will be marginal increase in terms of dust load due in ML area due to proposed expansion of Nuagaon iron ore mines including beneficiation plant. However, the above surface activities too cause insignificant impact, which will be confined to the lease area only, while adopting the control measures during the mining operation. Besides, there will not be any adverse impact on ML area, within the boundary and the area outside community with implementation of adequate dust control measures.The Jajangvillage is located in the ML area. The resultant controlled concentrations were found to be 6.0µg/m^3which will be below NAAQ standards. The resultant controlled concentrations at Bandhuabeda and jadibahal villages are 11.8 µg/m^3 and 3.2 µg/m^3.The resultant ground level concentrations on nearby habitat are presented in Table-4.16(C).

MITIGATION MEASURES TO BE REQUIRED IN THE PROJECT IMPACT AREA.

Keonjhar Division :

Due to diversion of forest area of 669.078 ha. (as per DGPS Survey)/666.150 Ha (as per ROR) for mining purpose the wild-life habitat to this extent will be reduced. The congregation of wild animals in the impact area is likely to increase. These animals will therefore be susceptible to greater threats. There will also be additional biotic pressure on the impact area. There are several mining projects within 10km radius. Due to the large extent of mining area adjacent to the current mining project within 10kms radius, the effective impact area will be of 12.008 kms radius. The Management Plan therefore aims at reducing the perceived threats beyond these areas. These activities beyond the Mining project area shall be implemented by the DFO/Forest Department.

Besides this an action plan aiming at proper distribution of food, water and shelter as far as possible and achieving the desired composition of wild fauna population, **with special reference to Schedule-I fauna and endangered species has been dealt in this chapter.**

Now a days conservation of forests and wildlife need participatory based culture. Unless the local communities who are very much associated with the forest and wildlife since time immemorial are taken into confidence through this participatory based culture, no plan/project can be successful.

Hence, while proposing different interventions for protection of forest and wildlife emphasis have been focused on the capacity building of adjoining forest dependent communities and their peripheral developments like Awareness Campaign in this plan.

The different mitigative interventions proposed by DFO, Keonjhar to mitigate the adverse impact of mining in both the divisions are as under.

WILDLIFE HABITAT MANAGEMENT

1. **Restorative intervention in the habitat** :

The Nala flowing inside the forests becomes dry during summer months at most of the sites depriving the available wild fauna from water. Therefore, habitat management creating a conducive environment for sustenance of wildlife and their proliferation is one of the important strategy in preparing this plan. The following measures for improvement of habitat securing food, water and shelter for the wildlife are suggested at the beginning.

It is proposed to improve the wild life habitat outside the project area with the following activities.

The forest blocks surrounding the project area are: Sidhamath & Baitarani Reserved Forests. These Reserved Forests have been placed under Improvement Working Circle, Rehabilitation Working Circle and Protection Working Circle. In these Forests, improvement of forest cover is required to be taken up and the protection mechanism needs to be augmented to preserve the Wildlife habitat. These forests are under heavy biotic pressure and in the process of degradation.

i) **Soil and moisture conservation measures.**

These areas need to be protected for conservation of forest and wildlife. The interventions are proposed for improment of wildlife habitat through massive soil and moisture conservation measures line gully plugging, check daming contor trench and subsurface dyke etc. required in the above RFs, on consultation with the Forest Department Officials of Keonjhar Forest Division. A lumsum amunt Rs. 15.00 lakhs in proposed for the above work.

ii) **Creation of enrichment plantation by the side of Rivers, nalas & swamp areas** :

It is proposed to create 15 ha. enrichment plantation by the side of penial nalas and swamp area insides Siddhamatha, Baitarani & Chamakpur RF. Besides plantation can be raised on the bank of river Baitarani, Sunanadi etc. flowing inside forest areas. The plantation species shall be fodder, fruit bearing shady type @ 1,000 plant/ha. This plantations shll provide food to the wild-animals pertifcullary to mega harbivoures as the wildlife habitats in the impact zone are devoid of sufficient food for them.

iii) **Fire Protection** :

The fire protection is the most important aspect of forest protection and improvement of habitat. Almost all forest areas being surrounded by human habitations, due to shifting cultivation get burnt repeatedly during summer.

Fire is the most devastating agent for degradation of habitats. It is therefore, proposed to take up fire protection with right earnest. Prior to fire season, the V.S.S and Gram sabha including some revenue villages located and the forest fringe will have to be taken into confidence through awareness programmes and incentives to assist in prevention of forest fire.

Provision of fire blowers : It is proposed to purchase required nos. of fire blowers as, a modern instrument in extinguishing forest fire and laying out fire lines inside forests in addition to conventional fire fighting tools. Purchase of fire fighting equipments – Fire Blowers specifically 10 Nos. at the cost of Rs. 60,000/- per blower has been suggested with a total financial outlay of Rs. 6.00 Lakhs over the span of 10 Years.

Deployment of a Fire fighting squad consisting of 5 members with hird vehicle, POL etc. in the project impact area over the plan period during fire season as per the approved cost norm stipulated by PCCF, (WL) & CC, Odisha @ Rs. 4,61,150/- per annum over 10 years of plan period.

WILDLIFE PROTECTION AND ANTI-DEPREDATION :

a. **Fencing of Unguarded open wells** to prevent elephants and their calfs being trapped has been planned at a cost of Rs. 50,000/- each well in 10 Nos. of strategic locations of such open and unguarded wells in and around the project and project impact area. The net cost allocated for the same according to a Lumpsum basis is Rs. 5 Lakhs over a plan of 10 years.

b. **Augmentation of staff strength by creation of a new cadre of Anti-poaching/Anti depredation squad :** The field staff strength of Barbil Range of Keonjhar Division is not as adequate to extend support for protection of the forests of zone of influence amidst various assignments and workloads. Therefore, it is proposed to build a skilled cadre of young “Anti-Poaching/Anti-depredation Squad” (Wildlife protection squad/antidepredation squad) who will be selected from the forest dwelling communities. 5 nos. youths from different villages/V.S.S will be selected in consultation with the Gram Sabhas/VSS. They will be given elementary training for about a week at the Forest Division Headquarter on relevant aspects of conservation and protection, with the help of resource persons on the subjects.

A curriculum for such training is to be developed encompassing subjects like importance of forests and wildlife, need for their conservation, protection and development, technique of forest regeneration, habitat development, control of forest fire, grazing, poaching, communication methodology to ensure people's participation, tracking of elephants, prevention of depredation by wild life etc.

On completion of training, they will be deployed to work under the guidance of local forest staff. It is also proposed to provide them a hired vehicle with POL and a daily wage driver over the plan period and communication equipments etc to assist the staff in normalising man-elephant conflict wherever occurs. An amount of **Rs. 132.440 lakhs** is provisioned for the purpose.

c) In view of man-elephant conflict in villages of project impact area cusing house damage and raiding food grain, stored in the houses provision is made for construction of **Grain Store House** having plinth area 450 qft. @ Rs. 4,90,000/- per village for 10 strategic villages victim to crop raiding to store food gr`ain with in an amount of **49.00 lakhs.**

d) The villages will be supplied with **Metallic grain bin** 30 nos. per village to store food grain. It is proposed to distribute the bins to 10 villages. The cost shall be @ Rs. 3,500/- per piece to talling to **10.50 lakhs.** This will dicrease damage to houses and food grain explotation in houses of project impact area

e) Provision for **Elephant proof trench** of size $\frac{3\text{m x 1 m.}}{2}$ x 2.5 $m.$ across the entry path of elephant to the villages at strategic locations to prevent house and grain raiding over a length of 2 KM wherever required. The cost of excavation of trench over 2 KM shall be @ Rs. 5,26,374.00 per KM over 2 KM totaling to Rs. **10.72748 lakhs.**

f) Provision for **Manchan (Mini watch tower**) on hillocks and tall trees to watch the movement of elephants and to alert the villagers about elephant movement.

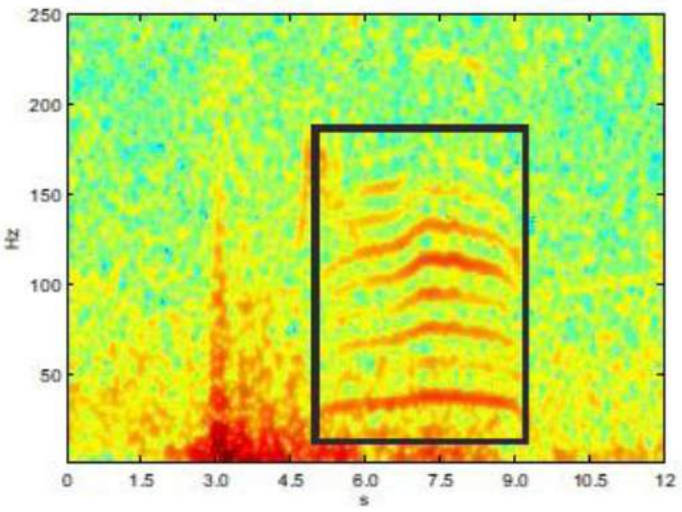
g) Provision for **Paddy Harvester** for the villagers for early harvesting of paddy from their field and to store in safe place to avoid crop damage by wild elephants.

h) Provision for **Camera trap** with infrared.

i) **Solar electric fencing** : Some of the villages regularly affected by elephant depredation can be insulated by installing Solar electric fence around the village. An amount of Rs.5.00 lakhs is proposed for the activity.

j) **Provision for warning and wading system to prevent elephant intrusion :** Acoustic Detection of Elephant Presence in Noisy Environments The communication of elephant with one another is by low frequency sound, which can travel several kilometers. The elephants communicate sound is called rumble, which prolong into infrasound band. The rumble is a harmonic sound. It is the fundamental frequency in the range of 15-35Hz in duration between 0.5 and 5s.The acoustic detection of elephants by their call is currently the most promising approach towards an early warning system that is able to detect the presence of elephants in large field areas.

Figure: Typical Elephant rumble signal



This SYSTEM utilizes all these fears accordingly with the distance of the elephant from the human settlements. The block diagram is shown below. As shown in the figure , our solution involves three PIR sensors and two vibration sensors.

The two vibration sensors have different operating range (say 20m, 15m). When the heavy vibration caused by elephant movement is sensed within 20m, first vibration sensor sends the electrical pulses. It is then compared with the threshold value. If the value matches, the powerful flashing lights are activated. This should drive it back to the forest. Due to this, vibration sensors will turn off the flashing light.

If it doesn't and if the elephant continues in its path without fearing for the light, vibration sensor 2 gets activated once it is within 15m range and sends the electrical pulses, if it matches with the same threshold value and after some distance, it activate three PIR sensors which in turn

activates the sound system which produces bee's sound and with the help of GSM, messages and calls are sent to village representatives and the forest department and alerts them.

If the bee sound drives the elephant back into the forest, again the message comprising of that the elephant are not in human settlement area are send to forest department.

figure: Block Diagram for proposed system

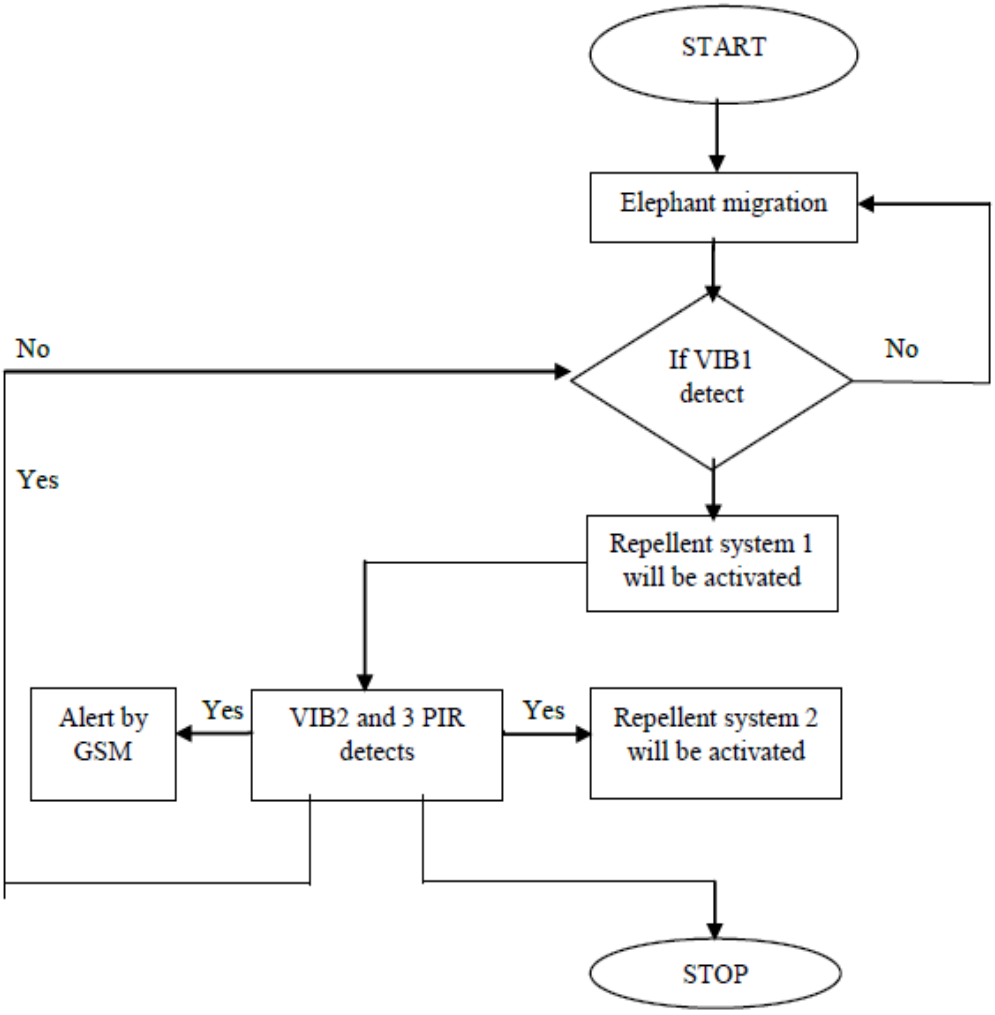
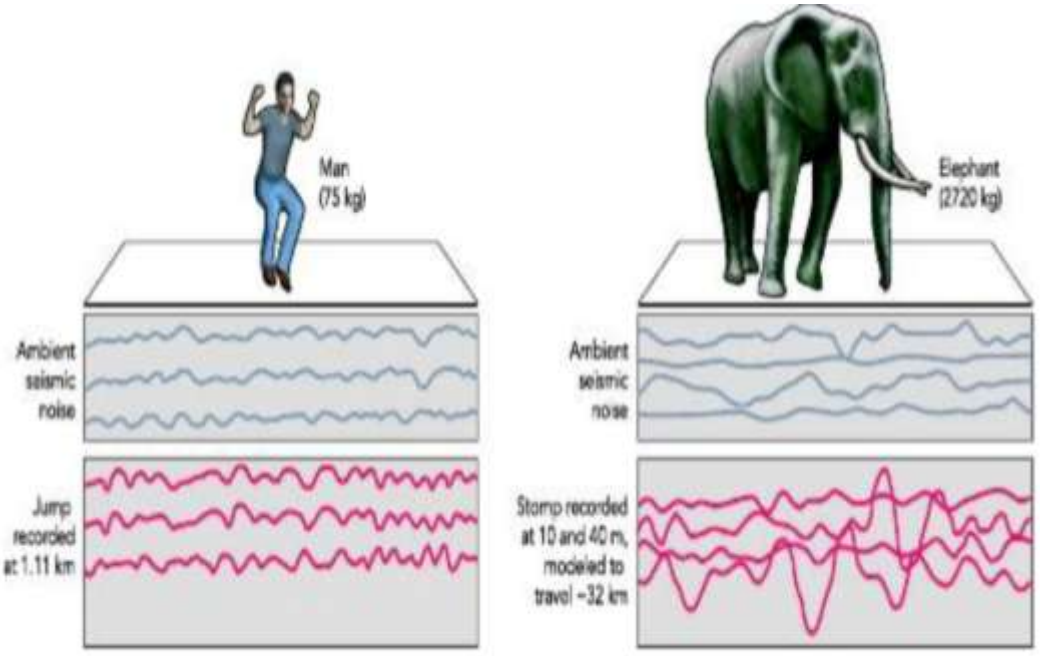
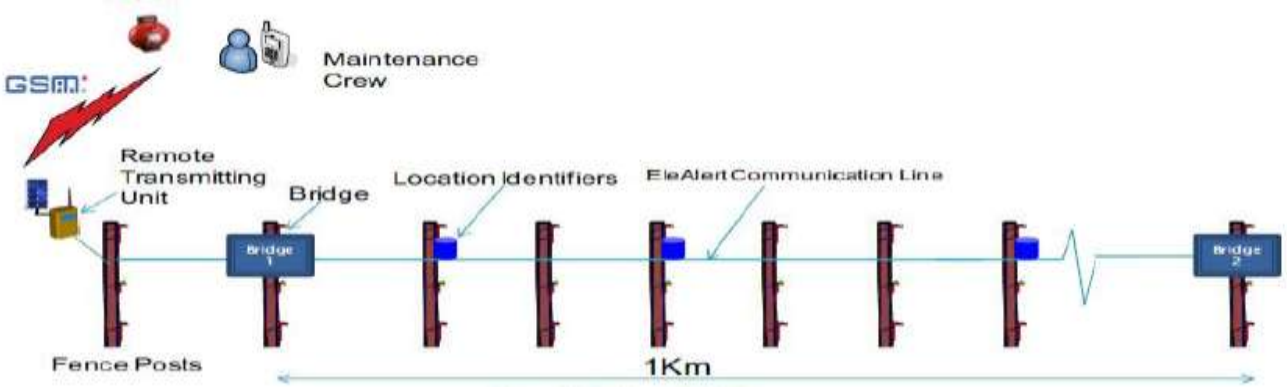


Figure: Flow Diagram to detect the Elephants' Movement

Vibration sensor (SW18020P) Vibration sensors are used for measuring, displaying, and analyzing linear velocity, displacement and acceleration. The two contacts of sensor are not connected in idle condition. When external force is acted upon either by movement or vibration, the sensor's two contact pin are closed and contact is made between the two pins. When the force is removed the terminals of sensor returns back to the open contacts. Sensor is made up of a small spring mechanism, which makes the contact ON when the applied vibration force is at above a certain threshold. Vibration sensor has two legs coming out of it. Normally the two terminal are insulated by a resistance value more than 10MOhm. When someone applies vibratory force on the switch, spring inside the switch vibrates and makes a momentary short circuit between the two terminals.

Electric Fence Intrusion Alert System (eleAlert) The electric fences intrusion system is implemented to detect the intrusion of elephant using fences which separate human and wildlife habitats. This method is to improve the effective electric fences to dominant the elephant conflict in many part of the world. Electric fence intrusion alert system uses a network of sensors to detect and locate damages instantly and alert communities under tread via the mobile communications network.





To wade-away the wild elephants from village area to their habitat forest areas it is proposed to supply 2 units of **Elephant and Mega Wildlife Movement Warning & Wading System** to the D.F.O., Keonjhar Forest Division @ Rs. 15.00 Lakhs each alongwith the cost of maintenance of Rs 20,000/- per year over the plan period, a total cost of **Rs. 32.00 lakhs.**

k) **Awareness** : Wild elephant use to pass from one patch of forest area to another crossing Malda, Joda state highway at some points. Therefore it is proposed to install large size (6' x 4') metaling radium sign board with strong iron angle stay at sutabile height and distance @ 10 each (5 at one side of the road) near each elephant crossing point to alert the vehicles to reduce the speed and to watch the road crossing of the elephyants to prevent of elephant and abvoid casuality. Total 2 nos. of such sign board installation as proposed.

Support activities :

1) **Provision of corpus funds for exgratia** : Due to anticipated impact of mines there shall be man-animals/man-elephants conflict in the project impact area. As a result there shall be human injury/ death, crop and house demage. Therefore in order to mitigate the above situations in the field and to provide immediate compensation to the victims of the above incidents a lumsum amount Rs. 10.00 lakhs is kept as a revolving funds to meet the immediate requirement with the DFO.

2) **Monироring and evaluation :** In order to monitor and evaluate the above interventions in the field by the higher officers like Divisional Forest Officer, Regional Chief Conservation of Forest and procurement of latest satellite map every year for analysis and to evaluate the plan, provision of Rs. 1.00 lakh is kept per year spreding over plan period totaling to Rs. 10.00 lakhs.

A. Financial implication of the project area.

Sl. No.	Particulars	Remarks
1	Provision for graded bund all along the boundary of the lease area wherever necessary to allow the surface runoff from the lease area to percolate in to ground instead of flowing in to adjoining villages, corn fields & other wild life habitats as a soil & conservation measure	To be implemented by project proponent at the project cost
2	Cost of photo voltaic fencing around the active mining pits inside the ML area over a length of about 2KM to prevent fall of wild animals in to the pit.	-do-
3	Supply 10 units of high frequency ultra-sonic Sound elephant repellents to the D.F.O., Keonjhar Forest Division cost of maintenance.	-do-
4	Establishing Bulk messaging System for immediate message spreading from field to all grass-root level forest Officials, ROs, ACFs & D.F.O., Keonjhar over the plan period.	-do-
5	Provisioon of hired vehicle with POL for movents of rapid response team deployed at DFO office over the plan period i.e 10 years.	-do-

Sl. No.	Particulars	Remarks
6	Provision of long Rechargeable Flash Light torches 200 nos. to be supplied to the strategic villages/VSS members/elephants trackers to wade away elephants/sloth bear	To be implemented by project proponent at the project cost
7	Purchase and supply of android based Mobile handset for quick message transmitting and immediate communication	-do-
8	Provision of 02(Two) nos. Drone camera with accessories for Divisional Forest Officer Keonjhar monitoring of wild animals in stress in forest areas.	-do-
9	Health camp and Cattle immunization camps in the project impact area at regural interval over the plan period.	-do-

The project proponent shall carryout different intervanetion as narrated above in addition to prescriptions imposed in approved mining plan and involvemental management plan and shall hand over the materials mentioned above to mitigate man-elephant conflict to the Divisional Forest Officer at the project cost.

Divisional Forest Officer
Keonjhar Division

B. FINANCIAL IMPLICATION THE PROJECT IMPACT AREA OF KEONJHAR.

Sl. No.	Particulars	Unit	Rate (in Rs.)	Amount (in lakh)
1	**HABITAT IMPROVEMENT**			
	Creation of 15 ha. enrichment plantation of fruits bearing and fodder species mainly Jack fruit, Siali, Bara & Aswastha by the side of nalas & river banks and swampy sites in side forest areas @ 1,000 plant/ha. (as per onetime cost norm vide O.O No. 1109 dt. 8.11.2021 of PCCF, Odisha.	15 ha.	2,34,718/-	35.2077
2	**FIRE PROTECTION**			
i)	Deployment of a Fire fighting squad consisting of 5 members. @ Rs. 4,61,150/- per annum. For 10 years			46.115 46.42
ii)	Provision of fire blowers 10 nos. @ Rs. 60,000/- per each			6.00
3	**SOIL & MOISTURE CONSERVATION MEASURE**			
i)	Improvement of wildlife habitat in Chamakpur, Sidhhamatha and Baitarani RF through soil and moistures like gully plugging, check damming contour trench and subsurface dyke etc. wherever required on lumsum			15.00
4	**ANTIDEPREDATION AND PROTECTION MEASURES**			
i)	Supply of warning and wading system to prevent elephant intrusion along with maintenance of same @ Rs. 20,000/- per annum	02 nos.		32.00
ii)	Fencing of Unguarded open wells to prevent elephants and their calfs being trapped has been planned at a cost of Rs. 50,000/- lumsum each well in 10 Nos. of strategic locations of such open and unguarded wells in and around the project and project impact area over a plan of 10 years.	10 nos.		5.00
iii)	Provision for augmentation of staff strength by creation of a new cadre of **Anti-poaching/ Anti depredation squad** consisting of 5 members @ Rs. 13,24,400/-per year	5 members	13,24,400	132.440

iv)	Provision for a **Grain Store House** having plinth area 450 qft. @ Rs. 4,90,000/- per each per village for 10 strategic villages victim to crop raiding & house damage to store food grain.	10 nos.	4,90,000	49.00
v)	Provision for supply of **Metallic grain bin** 30 nos. per village to store food grain for 10 villages @ Rs. 3,500/- per piece. 300 nos.	10 village	1,05,000	10.50
vi)	Provision for **Elephant proof trench** of size $\frac{3m \times 1m}{2}$ x 2.5 *m.* across the entry path of elephant to the villages to prevent house and grain raiding @ Rs. 5,36,374.00 per KM at strategic locations over 2 KM	2 KM	5,36,374	10.72748
vii)	Provision for Camera trap with infrared	20 nos.	50,000	10.00
viii)	Provision for Manchan (Mini watch tower) on hillocks and tall trees to watch the movement of elephants and to alert the villagers about elephant movement.	1 no.	10,00,000	10.00
ix)	Cleaning of shrubs/herbs/grass along the elephant road crossing points at 50 meter width on both sides.		LS	5.00
x)	Provision for metallic radium painted sign board at 2 elephants road crossing sites @ 10 nos. each point, totaling to 20 nos. at strategic locations to avoid accident and casualty of elephants	20 nso.	LS 30,000/- eah	6.00
5	Corpus funds for exgratia			10.00
6	Payment towards cost of monitoring & evaluation procurement of latest satellite maps every year for analysis at division office @ 1.00 lakh per year x 10 years			10.00
	Total		393.30	**391.99018**
	20% cost escalation		78.66	78.398036
	Grand Total		471.96	**470.388216 or 470.400**

(Rupees four crore seventy thousand four hundred) only.

Rupees four crore seventy one lakh ninety six thousand only

Countersigned

Regional Chief Conservator of Forests
Rourkela Circle, Rourkela

Divisional Forest Officer
Keonjhar Division

C. FINANCIAL IMPLICATION THE PROJECT IMPACT AREA OF BONEI FOREST DIVISION

Sl. No.	Particulars	Unit	Rate (in Rs.)	Amount (in lakh)
1	**Antidepredation and Protection measures**			
i)	Provision for five members elephant squad with one hired vehicle & POL charges for 10 year.	1 unit	13,24,400	132.440
ii)	Construction of inter divisional protection camp shed at border for coordination for monitoring of elephant.	1 no.	20,00,000	20.00
iii)	Provision for establishing bulk massaging system for immediate message spreading from field to all grass-root level forest Officials ROs, ACFs & D.F.O Bonai including the maintenance cost of Rs. 4000 per year over the plan period	2 unit.	4,40,000	4.40
iv)	Provision for 5 units of high frequency ultrasonic sound elephant repellents to the DFO, Bonai Division 40,000 cach frequency and cost of maintenance Rs. 12,000/- per year	10 units	52,000	5.20
v)	Provision for long rechargeable flash light torchers 50 nos. to be supplied to the strategic villages/VSS members/ elephants trackers to wade away elephants.	200 nos.	1,000	2.00
vi)	Provision for camera traps and equipments etc,	25 nos.	50,000	12.50
vii)	Supply of warning and wading system to prevent elephant intrusion along with maintenance of same @ Rs. 10,000/- per annum	I unit	16,00,000	16.00
viii)	Provision of fire blowers 8 nos. @ Rs. 60,000/- per each	8 nos.		4.80
ix)	Provision for Paddy harvester to be supplied to be villages for early harvesting of paddy and store in safe place to avoid damage of paddy in corn field (Four cylinder 30 HP power paddy harvester).	1 no.	20,00,000	20.00

3	**Support activities.**			
i)	Corpus funds.		L.S	10.00
ii)	Provision for cattle immunization camps in the villages near the wildlife habitats		L.S	5.00
	Total			**232.3400**
	20% cost escalation			46.4680
	Grand Total			**278.808**

(**Rupees two crore seventy eight lakhs eighty thousand eight hundred**) only.

Countersigned

Regional Chief Conservator of Forests
Rourkela Circle, Rourkela

Divisional Forest Officer
Sonai Division

Bonai Division :

Chapter-IV (A)

Animal passage plan :

The project is a mining project comprising of 666.150 ha. & is 18.5 KM away from Karo-Karampada elephant corridor. Besides the project and project impact area does not from part of any protected area, elephant/tiger reserve. Biosphere reserve, elephant habitat zone and eco-sensitive zone. As narrated in Chapter-I elephants occasionally move inside the project impact area during crop season. There is also no National Highway occur either in the project area or project impact area. Therefore no animals passage plan is required relating to this project. However required precautions are have been proposed for elephant movement across the Malda-Joda State highway and other village roads.

Chapter-V

Financial implementation and monitoring :
Total financial implication of the proposal with cash flow statement for 10 years for both Keonjhar & Bonai division are furnished below :

The life of this mining has been estimated to be 50 years. But this plan is proposed for a period of 10 years. After completion of this plan period the same can be evaluated and further steps taken depending on requirement. However, if nccessary interim revision of this plan can be taken up depending on the actual requirements.

Regular monitoring and evaluation shall be done by the field officers and RCCF, Rourkela at the time of implementation for which fund has been kept in this plan. Year wise data shall be maintained to assess the trend of man-animal conflict due to implementation of this project and if required interim revisions can be made in consultation with the project proponent. The project proponent shall be give undertaking to prepared new plan one year before expiry of this plan. The PP shall under take to provide necessary assistance as where and when required to mitigate the advours impact generated causing man-animals conflict and degradation of habitat. The PP shall handover the tools, masonarics, vehicles as narrated in the interventions of project area in this plan.

ABSTRACT

CUMULATIVE TOTAL OF FINANCIAL FORECAST OF ACTIVITIES TO BE UNDERTAKEN IN KEONJHAR FOREST DIVISION & BONAI DIVISION GRAND TOTAL (A+B+C)

(in lakhs)

A) PROJECT AREA	Interventions to be implemented by project proponent at the project costs in the project area	
B) PROJECT IMPACT AREA (KEONJHAR DIVISION)	470.400 471.960	749.208 750.768
C) PROJECT IMPACT AREA (BONAI DIVISION)	278.808	

(Rupees seven crore forty-nine lakhs twenty thousand eight hundred) only.

Rupees seven crore fifty lakh seventy six thousand eight hundred only

Countersigned

Regional Chief Conservator of Forests
Rourkela Circle, Rourkela

Divisional Forest Officer
Bonai Division

Approved

Divisional Forest Officer
Keonjhar Division

Divisional Chief Conservator of Forests

B) ANNUAL WORK PLANS AND ANNUAL OUT LAY STATEMENT OF FINANCIALFORECAST OF ACTIVITIES TO BE UNDERTAKEN OVER 10 YEARS SPAN IN THE PROJECT IMPACT AREA (TO BE IMPLEMENTED BY DIVISIONAL FOREST OFFICER, KEONJHAR).

Sl. No.	Particular of works	0th & 1st year (Amount in lakh)	2nd year (Amount in lakh)	3rd year (Amount in lakh)	4th year (Amount in lakh)	5th year (Amount in lakh)	6th year (Amount in lakh)	7th year (Amount in lakh)	8th year (Amount in lakh)	9th year (Amount in lakh)	10th year (Amount in lakh)	Total (Amount in lakh)
1	Creation of 15 ha. enrichment plantation of fruits bearing and fodder species by the side of nals & river banks and swampy sites in side forest areas. Rs. 2,34,718/- per ha.	18.4101	3.6877	2.734	1.251	1.313	1.575	1.457	1.52	1.6	1.6599	35.2077
2	Deployment of a Fire fighting squad.	4.6415	4.6415	4.6415	4.6415	4.6415	4.6415	4.6415	4.6415	4.6415	4.6415	46.415
3	Provision of fire blowers.	6										6.00
4	Soil and moistures conservation measures.	5	5	5								15.00
5	Supply of Warning and wading system.	30.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		32.00

6	Fencing of Unguarded open wells	2.5	2.5									5.00
7	Provision for augmentation of staff strength by creation of a new cadre of Anti-poaching/Anti depredation squad.	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	132.44
8	Provision for a Grain Store House.	24.5	24.5									49.00
9	Provision for supply of Metallic grain bin.	5.25	5.25									10.50
10	Provision for Elephant proof trench.	5.5	5.22748									10.72748
11	Provision for Camera trap with infrared	10										10.00
12	Provision for Manchan (Mini watch tower) on hillocks and tall trees to watch the movement of elephants and to alert the villagers about elephant movement.	10										10.00
13	Clearning of shrubs/herbs/ grass along the elephant road corssing points at 50 meter width on both sides.	1	1	1	1	1						5.00

14	Provision for metalllic radium painted sign board at 2 elephants road corssing sites @ 10 nos. each point, totaling to 20 nos. at strategic locations to avoid accident and casualty of elephants.	6										6.00
15	Corpus funds for exgratia	9										9.00
16	Payment towards cost of monitoring & evaluation procurement of latest satellite maps every year for analysis at division office @ 1.00 lakh per year x 10 year	1	1	1	1	1	1	1	1	1	1	10.00
	Total	**152.41560**	**66.22068**	**27.78950**	**21.30650**	**21.36850**	**20.63050**	**20.51250**	**20.57550**	**20.65550**	**20.51540**	**391.99018**
	20% escalation											78.39804
	Grand Total											**470.38822 or 470.400**

(**Rupees four crore seventy lakhs forty thousand**) only.

C) ANNUAL WORK PLANS AND ANNUAL OUT LAY STATEMENT OF FINANCIALFORECAST OF ACTIVITIES TO BE UNDERTAKEN OVER 10 YEARS SPAN IN THE PROJECT IMPACT AREA (TO BE IMPLEMENTED BY DIVISIONAL FOREST OFFICER, BONAI DIVISION).

Sl. No.	Particular of works	1st year (Amount in lakh)	2nd year (Amount in lakh)	3rd year (Amount in lakh)	4th year (Amount in lakh)	5th year (Amount in lakh)	6th year (Amount in lakh)	7th year (Amount in lakh)	8th year (Amount in lakh)	9th year (Amount in lakh)	10th year (Amount in lakh)	Total (Amount in lakh)
1	Provision for five members elephant squad with one hired vehicle & POL charges for 10 year.	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	13.244	**132.44**
2	Construction of inter divisional protection camp shed at border for coordination for monitoring of elephant.	20										**20.00**
3	Provision for establishing bulk massaging system for immediate message spreading from field to all grass-root level forest Officials ROs, ACFs & D.F.O Bonai including the maintenance cost of Rs. 4000 per year over the plan period	4.4										**4.40**
4	Provision for 10 units of high frequency ultrasonic sound elephant repellents to the DFO, Bonai Division 40,000 each frequency and cost of maintenance Rs. 12,000/- per year	4.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	**5.20**

5	Provision for long rechargeable flash light torchers 50 nos. to be supplied to the strategic villages/VSS members/ elephants trackers to wade away elephants.	2										**2.00**
6	Provision for Camera traps and equipments etc.	12.5										**12.50**
7	Supply of warning and wading system to prevent elephant intrusion along with maintenance of same.	15.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	**16.00**
8	Provision of fire blowers	4.8										**4.80**
9	Provision for Paddy harvester to be supplied to be villages for early harvesting of paddy and store in safe place to avoid damage of paddy in corn field	20										**20.00**
10	Corpus funds	10										**10.00**
11	Provision for cattle immunization camps in the villages near the wildlife habitats	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**5.00**
	Total	**106.664**	**13.964**	**13.964**	**13.964**	**13.964**	**13.964**	**13.964**	**13.964**	**13.964**	**13.964**	**232.34**
	20% cost escalation											46.468
	Grand Total											**278.808**

(**Rupees two crore seventy eight lakhs eighty thousand eighty hundred**) only.

Chapter-VI

Maps/Appendics/Plans and cost Schedules/ relevant order

Maps (in 1 = 50,000 scale)

6 (a) Land use plan maps of the project existing and proposed on Survey of India Topo sheet No. F45N5, F45N9, F45H8 & F45H12.

6 (b)
Location Map showing site of elephant movement and wildlife depredation in the project impact area of Jajang Iron Ore Mines.

6 (c) Location map showing the distances of Jajang Iorn Ore Mines of M/s JSW Steel Ltd. from the National Park, Wildlife Santury and Elephant corridor.

6 (d) Location map showing other mining leases and forest diversion in the project impact area of Jajang Iron Ore Mines of M/s JSW steel Ltd. on Survey of India Topo sheet No. F45N5, F45N9, F45H8 & F45H12.

F.No. J-11015/57/2020-IA.II(M)
Government of India
Ministry of Environment, Forest and Climate Change
Impact Assessment Division
***

Indira Paryavaran Bhavan,
Prithvi Wing, 2nd Floor, Aliganj,
JorBagh Road, New Delhi-110 003

Dated: 5th February, 2021

To,

M/s JSW Steel Ltd.
JSW Centre, BandraKurlaComplex,
Bandre (East),
Pincode: 751009.

Subject: Jajang Iron Ore mine of M/s JSW Steel Ltd. for production of 12.80 million TPA (ROM) of Iron ore with maximum waste of 28.589 MTPA (OB/IB/SB) along with screening, crushing in lease area of 669.078 Ha (as per DGPS Survey)/666.150 Ha (as per ROR) land in villages Jajang, Jadibahal, Palsa(Ka), Bandhuabeda, Tehsil Barbil, District Keonjhar, Odisha- ToR reg.

Sir,

This is with reference to online proposal no. IA/OR/MIN/175990/2020ofM/s JSW Steel Ltd. is for grant of Term of Reference for production of 12.80 million TPA (ROM) of Iron ore with maximum waste of 28.589 MTPA (OB/IB/SB) along with screening, crushing in lease area of 669.078 Ha (as per DGPS Survey)/666.150 Ha (as per ROR) land in villages Jajang, Jadibahal, Palsa(Ka), Bandhuabeda, Tehsil Barbil, District Keonjhar, Odisha. The mine lease area falls under survey of India Topo sheet No. 73 F/8, F/12, G/5 & G/9. The indicative range of coordinates of the lease area is:

Pillar No.	Latitude	Longitude
1	21^0 54'44.23926"N	85^0 26'14.55590"E
23	21^0 53'33.49374"N	85^0 25'45.85255"E
31	21^0 55'52.37093"N	85^0 24'49.65672"E
12	21^0 56'08.11524"N	85^0 26'50.70226"E

2. As per EIA Notification dated 14th Sept, 2006 and its subsequent amendments, the project falls under Project Activity 1 (a) "Mining of Minerals" and is Category "A" project.

3. The Project Proponent vide proposal No. IA/OR/MIN/175990/2020 dated 28.09.2020 applied for grant of ToR and submitted Form-1 & Pre-Feasibility

Report and the proposal was considered in the 23rd EAC meeting held during November 23-25, 2020. The committee after detailed deliberations deferred the proposal for want of additional information. Project Proponent submitted the reply vide letter no. JSW/S/O/2020/462 dated 18.12.2020. The proposal was considered in the 26th EAC meeting held during January 11-13th, 2021.

4. The Project Proponent has submitted that the Jajang iron ore mine (erstwhile lessee M/s Rungta Mines Limited) was one of the mines whose lease expired on 31.03.2020. Government of Odisha vide letter No. 3007/ S&M/ Bhubaneshwar/IV(Misc)SM-66/2016 dated 18th March 2020 issued the notice for grant of Mining Lease (ML) for Jajang Iron Ore Block over an area of 666.15 ha as per ROR (669.078 ha as per DGPS computation) in villages Jajang, Jadibahal, Palsa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar District, Odisha for a mineable reserve size of about 34.87 Million tonnes (Mt).

The Project Proponent submitted that in pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated 6th December, 2019 for commencement of the auction process to grant the mining lease in respect of Jajang Iron Ore Block located in villages Jajang, Jadibahal, Palsa (Ka), Bandhuabeda under Barbil tehsil of Keonjhar district, Odisha. The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for the said mineral block and M/s JSW Steel Limited was declared as the Preferred Bidder under Rule 9(9) (iii) of Mineral (Auction) Rules, 2015. Without prejudice to the generality of the provisions of section 8B(2) of the MMDR Act, 1957, the details of the valid rights, approvals, clearances, licenses, and the like held by the previous lessee are vested in favor of M/s JSW Steel Ltd by the Govt. of Odisha for a period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearances, licenses, permits, and the like, whichever is earlier vide order No-4190/SM, dated 29.05.2020. M/s JSW Steel Limited being successful bidder upon execution of mining lease deed, the Successful Bidder shall immediately, but not later than one hundred twenty days from the date of execution of mining lease, apply afresh for all necessary rights, approvals, clearances, licenses and the like under the applicable statutes, rules or regulations, as the case may be, for obtaining the necessary clearances to enable further continuance of the mining operations beyond two years and vesting order shall be valid for a period of two years from the date of execution of new lease deed or till the date of getting all fresh approvals, clearances, licenses, permits, and the like, whichever is earlier."

Subsequent to signing of the MDPA, M/s JSW Steel Limited has made payment of the third installment being the eighty percent of the upfront value and executed and registered the mining lease with the Government of Odisha on 27.06.2020 and the mining lease was granted in favor of M/s JSW Steel Limited for a period of 50 years w.e.f 27.06.2020.

5. The Project Proponent has submitted that the allotted mining block has an area of 666.15 ha as per ROR (669.078 ha as per DGPS computation). As per LS certified by Tahasildar, Barbil- Forest: 543.916 ha and Non Forest area 121.003 Ha. (Stage-II) FC of 447.811 ha (incl 44.70 ha Rev.F) already diverted on 28.08.2014 & vested to JSW for 2 years. Fresh forest clearances under FC Act, 1980 for diversion of 543.916 ha of forest land has also been applied vide Proposal No. FP/OR/MIN/50705/2020 dated 09.10.2020.

6. The Project Proponent has submitted that the total mineable reserves are 34.87 Million tonnes (Mt) as on 01.04.2020 as per approved mining plan in the name of M/s JSW Steel Limited vide letter no. MP/A/13-ORI/BHU/2020-21 dated: 19.08.2020. Fully mechanized open cast method of mining by drilling and blasting and by deploying HEMM equipment's like hydraulic drills and excavators, wheel loaders, dumpers, will be undertaken. The height and width of the benches for iron ore will be kept at 9 m and 15 m respectively. The working of benches will be commenced from top and extended to bottom benches. The excavated ROM ore is proposed to be processed in the crushing and screening plants to obtain the lump and fine ore as product mix. The iron ore lumps and iron ore fines extracted from the mine will be transported through railway/port/road to JSW Steel Plants. There are two no.s of railway siding namely, BIL sliding, Jajang Railway sliding existing within the mine lease area. These sidings will be used for transportation of ore of Jajang block. Further, the Railway sidings will also be used for transportation of ore of other mining leases viz., Nuagaon, Narayanposhi, Gonua& upcoming mines of M/s JSW Steel Ltd. The excavated ROM ore is proposed to be processed in the 3x 360 TPH, 2x 200 TPH, 1x175 TPH mobile crushing units and 10x400 TPH, 1x 180 TPH, 1x170 TPH mobile screening plants to obtain the lump and fine ore as product mix and the dry fog and water sprinkling system is in place as mitigation measure.Further no mineral processing plant is proposed. However, in future if any change in process is proposed JSW will approach concerned authority for approval.

7. The Project Proponent submitted that the total make-up water requirement for the proposed mining is about 2098 m3/day and it will be met from surface water and ground water sources. NOC from CGWA for 1015 m3/day is already vested to JSW for 2 years. PP submitted that hardcopy NOC application was submitted to CGWB on dated 16.10.2020 as the online application portal was under maintenance due to up gradation of new guidelines.

8. The Project Proponent submitted that the mine area does not cover any habitation. Hence, the mining activities do not involve any displacement of human settlement. No public buildings, places, monuments etc., exist within the lease area or in the vicinity. The mining operations will not disturb / relocate any village. In view of this, there are no Rehabilitation & Resettlement issues.Project Proponent has submitted that NEERI compliance report was not handed over by earlier lessee. However, JSW has requested SPCB, Odisha and Regional Office MoEF&CC for providing the NEERI compliance status submitted by earlier lessee i.e. M/s Rungta Mines on 26.11.2020 and same is under consideration.

9. The Project Proponent submitted that One case is pending for proposed Jajang mine at Odisha High Court with order no. WP (C) 24918/2020 regarding the refund of excess stamp duty paid during the time of registration of lease deed. The court has been pleased to issue notice to State Govt. of Odisha and the next date is fixed to 15th January 2021. The outcome of the case has no impact on the mining operations.

10. The Project Proponent submitted that the total capital investment in the Jajang iron ore mine is about Rs. 485 Crores which includes the cost of mine development, plant & machinery, utility facilities and mine closure cost.

11. Based on the information submitted and presentation made by the PP and the Consultant during the 26th EAC meeting held during 11-13th January, 2021, the Committee **recommended** the proposal grant of Standard Terms of Reference for production of 12.80 million TPA (ROM) of Iron ore with maximum waste of 28.589 MTPA (OB/IB/SB) along with screening, crushing in lease area of 669.078 Ha (as per DGPS Survey)/666.150 Ha (as per ROR) land in villages Jajang, Jadibahal, Palsa(Ka), Bandhuabeda, Tehsil Barbil, District Keonjhar, Odisha. In addition to Standard Term of Reference for non-coal mining, standard ToR as per the recommendation made by NEERI in its carrying capacity study for Odishaalong with the specific conditions.

12. The Ministry of Environment, Forest and Climate Change has examined the proposal in accordance with the Environmental Impact Assessment Notification, 2006 and further amendments thereto and hereby accords the above mentioned Terms of Reference (ToR) as recommended by EAC during its 26th EAC meeting held during 11-13th January, 2021 for grant of Standard Terms of Reference for production of 12.80 million TPA (ROM) of Iron ore with maximum waste of 28.589 MTPA (OB/IB/SB) along with screening, crushing in lease area of 669.078 Ha (as per DGPS Survey)/666.150 Ha (as per ROR) land in villages Jajang, Jadibahal, Palsa(Ka), Bandhuabeda, Tehsil Barbil, District Keonjhar, Odisha. In addition to Standard Term of Reference for non-coal mining, standard ToR as per the recommendation made by NEERI in its carrying capacity study for Odishaalong with following specific conditions in addition to addition to the Standard ToR applicable to Non-Coal Mining Sector:

Specific Term of Reference

i. The PP shall submit the present state of mine including primary environmental baseline data along with TOR application in order to assess the status and level of environmental compliance while transfer of lease. The PP must show any non-compliance of earlier EC by previous occupier so that the same can be considered at the time of appraisal for grant of Environmental Clearance.

ii. The TOR should also include damage assessment due to such noncompliance as one of the activities. In absence of such disclosure by PP, any subsequent identification of environmental non- compliance would be liability of new PP. The information to be submitted may be related to, but not limited to,

a. Compliance of mining plan, including waste and OB dump management, mine closure plan etc.
b. Compliance to Common cause judgment
c. Status of R&R
d. Compliance of plantation
e. Compliance of public hearing issues
f. Status of complaints/ court cases/legal action
g. Compliance of specific conditions of earlier EC

iii. MoEF&CC RO office shall preferably conduct visit of each of such mine lease/s where e-auction have been conducted to document the compliance status of existing EC at such leases, at earliest.

iv. The Project Proponent shall undertake the peripheral plantation and closed areas as well as gap plantation within 6 months with the seedling of 6-8 ft height having atleast 90% survival rate. An undertaking for the same also needs to be submitted by PP.

v. New lessee shall take possession of all records and documents related to EC and consent form the earlier lessee, including EIA reports, EC, consent, correspondence with MOEFCC and SPCB/CPCB etc.

vi. The new lessee shall provide the NRSC certified imaginary of the project site, depicting the real status of land use, canopy coverage, level of plantation, land degradation etc., one at the time of taking possession of lease and second after 6 -12 months to assess changes effected by present occupier.

vii. Cost of the CER calculated shall be utilized for the concerns of the people in terms of health, education, and infrastructure and environment protection. PP also shall include the budget for the betterment of schools nearby and to facilitate the online education system by providing Wi-Fi connectivity and desktops/tablets.

Additional TOR's:

I. PP should provide in the EIA Report details of all the statutory clearances, permissions, no objection certificates, consents etc. required for this project under various Acts, Rules and regulations and their status or estimated timeline after grant of EC.

II. PP should submit the revenue plan for mining lease, revenue plan should be superimposed on the satellite imaginary clearly demarcate the Govt.

land, private land, agricultural land etc.

III. PP should submit the real-time aerial footage & video of the mining lease area and of the transportation route. PP should submit the detailed plan in tabular format (year-wise for life of mine) for afforestation and green belt development in and around the mining lease. The PP should submit the number of saplings to be planted, area to be covered under afforestation & green belt, location of plantation, target for survival rate and budget earmarked for the afforestation & green belt development. In addition to this PP should show on a surface plan (5-year interval for life of mine) of suitable scale the area to be covered under afforestation & green belt clearly mentioning the latitude and longitude of the area to be covered during each 5 years. The capital and recurring expenditure to be incurred needs to be submitted. Presently in India there are many agencies which are developing forest in short interval of time. Thus, for the plantation activities details of the experts/agencies to be engaged needs to be provided with budgetary provisions.

IV. PP should submit the quantity of surface or ground water to be used for this project. The complete water balance cycle need to be submitted. In addition to this PP should submit a detailed plan for rain water harvesting measures to be taken. PP should submit the year wise target for reduction in consumption of the ground/surface water by developing alternative source of water through rain water harvesting measures. The capital and recurring expenditure to be incurred needs to be submitted.

V. PP should clearly bring out the details of the manpower to be engaged for this project with their roles /responsibilities/designations. In addition to this PP should mention the number and designation of person to be engaged for implementation of environmental management plan (EMP). The capital and recurring expenditure to be incurred needs to be submitted.

VI. PP should submit the year-wise, activity wise and time bound budget earmarked for EMP, occupational health surveillance & Corporate Environmental Responsibility. The capital and recurring expenditure to be incurred needs to be submitted.

VII. PP should submit the measures/technology to be adopted for prevention of illegal mining and pilferage of mineral. PP should submit the detailed mineralogical and chemical composition of the mineral and percentage of free silica from a NABL/MoEF&CC accredited laboratory.

VIII. PP should clearly show the transport route of the mineral and protection and mitigative measure to be adopted while transportation of the mineral. The impact from the center line of the road on either side should be clearly brought out supported with the line source modelling and isopleth. Further, frequency of testing of Poly Achromatic Hydrocarbon needs to be submitted along with budget. Based on the above study the compensation to be paid in the event of damage to the crop and land on the either side of the road needs to be mentioned. The PP should provide the source of equations used and complete calculations for computing the emission rate from the various sources.

IX. PP should clearly bring out that what is the specific diesel consumption and steps to be taken for reduction of the same. Year-wise target for reduction in the specific diesel consumption needs to be submitted.

X. PP should bring out the awareness campaign to be carried out on various environmental issues, practical training facility to be provided to the environmental engineer/diploma holders, mining engineer/diploma holders, geologists, and other trades related to mining operations. Target for the same needs to be submitted.

XI. The budget to be earmarked for the various activities shall be decided after perusal of the Standard EC Conditions published by the Ministry. After perusal of Standard EC conditions if agreed PP should also submit an undertaking by the way of affidavit for Compliance of Standard EC conditions already prescribed by the Ministry vide O.M. No and Specific condition if prescribed by the EAC/MoEF&CC.

XII. The PP should ensure that only NABET accredited consultant shall be engaged for the preparation of EIA/EMP Reports. PP shall ensure that accreditation of consultant shall be valid during the collection of baseline date, preparation of EIA/EMP report and during the appraisal process. The PP and consultant should submit an undertaking the information and data provided in the EIA Report and submitted to the Ministry are factually correct and PP and consultant are fully accountable for the same.

XIII. The PP should submit the photograph of monitoring stations & sampling locations. The photograph should bear the date, time, latitude & longitude of the monitoring station/sampling location. In addition to this PP should submit the original test reports and certificates of the labs which will analyze the samples.

Standard Terms of Reference (TOR) for Mining Project

1) Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to1994.

2) A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.

3) All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.

4) All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the

study area (core and buffer zone).

5) Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.

6) Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.

7) It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the proposed safeguard measures in each case should also be provided.

8) Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.

9) The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.

10) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.

11) Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.

12) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be

inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

13) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.

14) Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.

15) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.

16) A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.

17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

18) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

19) Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB

or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.

20) Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).

21) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

22) One season (non-monsoon) [i.e. March - May (Summer Season); October - December (post monsoon season); December - February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

23) Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

24) The water requirement for the Project, its availability and source should

be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.

25) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.

26) Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.

27) Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.

28) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.

29) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be.

30) Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.

31) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.

32) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if

contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.

33) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.

34) Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIAreport.

35) Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.

36) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.

37) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

38) Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.

39) Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

40) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.

41) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.

42) A Disaster Management Plan shall be prepared and included in the EIA/EMP Report.

43) Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.

44) Activity-wise time-bound action plan on the issues raised and

commitment made during public hearing to be submitted as part of the final EMP Report in compliance of the Ministry's OM F.No.22-65/2017-IA.III dated 30th September, 2020.

A. Recommendation of CSIR-NEERI Report on "Carrying Capacity Study for Environmentally Sustainable Iron and Manganese Ore Mining Activity in Keonjhar, Sundargarh and Mayurbhanj districts of Odisha State".

1) Department of Steel & Mines, Govt. of Odisha should prepare 5 years regional plan for annual iron ore requirement from the state, which in turn shall be met from different mines/zones (e.g. Joda, Koira.) in the state. Accordingly, sustainable annual production (SAP) for each zone/mine may be followed adopting necessary environmental protection measures.

2) The expansion or opening of new manganese ore mines may be considered only when the actual production of about 80% is achieved. Further, the mines that have not produced Mn ore for last two years and have no commitment in the current year as well; EC capacity in such cases may be reviewed. The Department of Steel & Mines, Govt. of Odisha shall submit the Annual Report on this issue to the MoEF&CC for further necessary action.

3) Analysis of baseline environmental quality data for the year 2014 and 2016 indicates that existing mining activities appear to have little / no potential impact on environmental quality, except on air environment, which was mainly due to resuspension of road dust. Therefore, all the working mines can continue to operate with strict compliance to monitoring of environmental quality parameters as per EC and CTE/CTO conditions of the respective mine, and implementation of suggested measures for control of road dust and air pollution. Odisha State Pollution Control Board has to ensure the compliance of CTE/CTO. Regional office of the MoEF&CC, Bhubaneswar shall monitor the compliance of the EC conditions. Regional office of the Indian Bureau of Mines (IBM) shall monitor the compliance of mining plan and progressive mine closure plan. Any violation by mine lease holder may invite actions per the provisions of applicable acts.

4) Considering the existing environmental quality, EC capacity, production rate, iron ore resources availability and transport infrastructure availability, the share of Joda and Koira sector works out to be 70% and 30% respectively for the existing scenario for the year 2015-16. However, for additional EC capacity, it can be 50:50 subject to commensurate infrastructure improvement (viz. SQTM, pollution free road transport, enhancement of rail network etc.) in the respective regions.

5) Continuous monitoring of different environmental quality parameters as per EC and CTE/CTO conditions with respect to air, noise, water (surface & ground water) and soil quality in each region shall be done. The environmental quality parameters should not indicate any adverse impact on the environment.

Monitoring within the mines should be done by individual mine lease holders, whereas outside the mine lease area, monitoring should be done by the Govt. of Odisha through various concerned departments/ authorized agencies. Various monitoring/ studies should be conducted through national reputed institutes, NABET/ MoEF&CC accredited laboratories/organizations. The reports submitted by individual mine lease holders and study reports prepared by other concerned departments/agency for each of the regions should be evaluated and examined by SPCB/ MoEF&CC.

6) Construction of cement concrete road from mine entrance and exit to the main road with proper drainage system and green belt development along the roads and also construction of road minimum 300 m inside the mine should be done. This should be done within one year for existing mines and new mine should have since beginning. The concerned departments should extend full support; wherever the land does not belong to the respective mine lease holders. The Department of Steel & Mines, Govt. of Odisha should ensure the compliance and should not issue the Mining Permits, if mine lease holder has not constructed proper cement concrete road as suggested above.

7) In view of high dust pollution and noise generation due to road transport, it is proposed to regulate/guide the movement of iron and manganese ore material based on the EC capacity of the mines. Accordingly, ore transport mode has been suggested, as given below in Table.

Table : EC Capacity based Suggested Ore Transport Mode (SOTM)

Code	EC	Suggested Ore Transport Mode
SOTM 1	≥ 5 MTPA	100% by private railway siding or conveyor belt up to public railway siding or pipeline for captive mines and 70% for non-captivemines
SOTM 2	Between 3 and <5 MTPA	Minimum 70% by public railway siding, through conveyor belt and maximum 30% by road - direct to destination or other public railway siding or above option
SOTM 3	Between 1 and < 3 MTPA	Minimum 70% by public railway siding and maximum 30% by road - direct to destination or by other public railway siding or above options
SOTM 4	<1 MTPA	100 % by 10/17 Ton Trucksor above options

It is mentioned by State Govt. of Odisha that currently about 45% of the iron ore is despatched using rail network and progressively it will be increased to about

60% by rail/slurry over a period of 5 years, taking into account time required to set up more railway sidings.

In view of present ore transport practices and practical limitations, all the existing mines should ensure adoption of SOTM within next 5 years. New mines or mines seeking expansion should incorporate provision of SOTM in the beginning itself, and should have system in place within next 5 years.

However, the State Govt. of Odisha shall ensure dust free roads in mining areas wherever the road transportation of mineral is involved. The road shoulders shall be paved with fence besides compliance with IRC guidelines. All the roads should have proper drainage system and apart from paving of entire carriage width the remaining right of way should have native plantation (dust capturing species). Further, regular maintenance should also be ensured by the Govt. of Odisha.

Transportation of iron & manganese ore through river (jetty) to nearest Sea port (Sea cargo option) may be explored or connecting Sea ports with Railway network from the mines to be improved further so that burden on existing road and rail network and also pollution thereof can be minimized.

Progress on development of dust free roads, implementation of SOTM, increased use of existing rail network, development of additional railway network/conveyor belt/ pipelines etc. shall be submitted periodically to MoEF&CC. Responsibility: Department of Steel & Mines, Govt. of Odisha; Time Period: 5 Years for developing railway/ conveyor belt facilities

8) Development of parking plazas for trucks with proper basic amenities/ facilities should be done inside mine. This should be done within one year for existing mines and new mines should have since beginning. Small capacity mines (in terms of lease area or production) not having enough space within the mine lease areas should develop parking plaza at a common place within the region with requisite facilities. Responsibility: Individual Mine Lease Holders; Time Period: 1Year

9) Construction of NH 215 as minimum 4 lane road with proper drainage system and plantation and subsequent regular maintenance of the road as per IRC guidelines. Construction of other mineral carrying roads with proper width and drainage system alongwithroadsideplantationtobecarriedout.Responsibility:DepartmentofSteel&Mines with PWD / NHAI Time Period: 2Years.

10) Regular vacuum cleaning of all mineral carrying roads aiming at "Zero Dust Re-suspension"maybeconsidered.Responsibility:PWD/NHAI/MineLeaseHolders;Time Period: 3 months for existingroads.

11) Expansion of existing mines and new mines should be considered after

conducting recent EIA Study (as per the provisions of EIA Notification 2006, as amended time to time) with proper justification on demand scenario for iron ore requirement and availability of pollution free transport network in the region. Responsibility: IBM, Department of Steel &Mines and MoEF&CC, NewDelhi.

12) **Mine-wise Allocation of Annual Production:** In case the total requirement of iron ore exceeds the suggested limit for that year, permission for annual production by an individual mine may be decided depending on approved EC capacity (for total actual dispatch) and actual production rate of individual mine during last year or any other criteria set by the State Govt., i.e. Dept. of Steel &Mines. Department of Steel and Mines in consultation with Indian Bureau of Mines-RO should prepare in advance mine-wise annual production scenario as suggested in Table, so that demand for iron ore can be anticipated, and actual production/ dispatch does not exceed the suggested annualproduction.

Table: Allocation of Production to Different Mines for 5 Years (as per approved Mining Plan)

Mine Lease	EC Capacity (MTPA)	Suggested Annual Production (MT)				
		2016-17	2017-18	2018-19	2019-20	2020-21
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Mine 1	X1					
Mine 2	X2					
Mine 3	X3					
Mine n	Xn					
Total	160 +dX	105	129	153	177	201
Next year allocation = Average of EC Capacity and Last year production						

13) **ExpansionofExistingMineshavingValidityupto2020:**Inviewofimplementation of MMDR Act 2015, wherein many non-captive mines are expected to be closed by March 2020, total iron ore production scenario has been. It is expected that the non- captive mines having validity till 2020 shall try to maximize their production (limited to EC capacity) in the remaining period. Further, depending upon availability of iron ore resources, these mines may also seek expansion of EC capacity. It may be noted here that total EC capacity of existing 25 working mines having validity upto 2020 is about 85 MTPA, whereas actual production from these mines has been only 44.677 MT(52.6%)during2015-16and57.07MT(67.1%)during2016-17.Also,itisexpected that these mines would not even be able to achieve ore production as per existing EC capacity till March 2020. Therefore, these existing mines should go for production to the fullest extent to meet the requisite demand from the State. However, where EC limit is exhausted, application for expansion may be considered. Further, the EC process (i.e. Grant of TOR, Baseline data collection, Mining plan/ scheme approval,

Public hearing, preparation of EIA/EMP Report. Appraisal by the EAC and grant of EC) takes about one year time. Under such circumstances, it is suggested that further applicationsforgrantofTORorgrantofECforexpansionofproductioncapacityofthe mine should be considered for those existing mines, which have exhausted their capacity subject to consideration of all environmental aspects. Responsibility: Department of Steel &Mines and MoEF&CC, NewDelhi.

14) **Sustained Iron Ore Production beyond 2020:** Considering the implementation of MMDR Act 2015, total production of iron ore in Odisha State is anticipated to be about 111 MT during 2016-17 (actual production was – 102.663 MT), 136 MT during 2017-18, 146 MT during 2018-19 and 146 MT during 2019-20. Then there will be substantial drop in total production (to the tune of 73 MT during 2020-21 onwards) due to closure of mines, which are valid up to 2020. Therefore, in order to maintain operation/sustained growth of downstream industries, iron ore mining in the region needs to be continued at a sustainable rate. The State Govt. through Department of Steel and Mines should initiate appropriate action to ensure continued availability of iron ore from the region, as per suggested sustainable annualproduction.

15) **ReservesEstimation**–MiningPlanandExploration:Appropriateactions(geo-technical investigation for qualitative and quantitative resource estimation &other preparations for auction of mines), may be initiated taken into account the existing working mines, and the mines which were operational at some point of time (but closed presently due to various reasons). The total iron ore reserves/ resources available within the total lease area of each mine should be estimated by State Govt./NMET/ GSI (or any other approved agency) with respect to: (i) Total lease area of mine (surface), (ii)Maximum depth to which resources could be available, (iii) Resources below the ground water table (if intersected), (iv) Reserves are to be estimated as per UNFC code with respect to quantity and quality (% Fe content), (v) Maximum mining rate and area forauction (after 2020) will be calculated based on total resources available and proposed life of mine leading toclosure of mine in a stipulated time period.

Responsibility: Department of Steel &Mines, IBM and GSI; Time frame: 1 year for the mines to be auctioned for next 2 years. The above mentioned organizations shall ensure the compliance with respect to timelines for implementations.

16) Depending upon availability of extractable iron ore resources within a mine, mining below the ground water table may be permitted after conducting necessary geological and hydro-geological study by GSI and requisite approval from the CGWB/CGWA (Central Ground Water Board/Authority). This can be explored at least in few mines on trial/pilot basis. Further, within a mine, it will be desirable to operate one pit at a time,andnextpitshouldbeopenedafterextractingmaximumpossibleresourcesfrom

the first pit, so that the exhausted pit can be used for back filling/ storing of low grade iron ore.However, depending upon the quantity and/or quality of iron/ manganese ore, other mine pits in the same mine lease may also be opened for sustainable scientific mining, as per approved mining plan/scheme of mining by IBM.The Department of Steel &Mines, Govt. of Odisha should initiate the pilot project so that minerals are fullyutilized.

17) **Commercial Utilization of Low Grade Ore:** R&D studies towards utilization of low- grade iron ore should be conducted through research/academic institutes like IMMT, Bhubaneswar, NML, Jamshedpur, and concerned metallurgical departments in IITs, NITsetc.,targetingfullutilizationoflow-gradeironore(Fecontentupto45%by2020 and upto 40% by 2025). In fact, life cycle assessment of whole process including environmental considerations should be done for techno-economic and environmental viability. R&D studies on utilization of mine wastewater having high concentration of Fe content for different commercial applications in industries such as cosmetics, pharmaceutical, paint industry should also be explored. Responsibility: IBM, Dept. of Steel &Mines, Individual Mine LeaseHolders

18) The mining activity in Joda-Koira sector is expected to continue for another100 years, therefore,itwillbedesirabletodevelopproperrailnetworkintheregion.Railtransport shall not only be pollution free mode but also will be much economical option for iron ore transport. The rail network and/or conveyor belt system upto public railway siding needs to be created. The total length of the conveyor belt system/ rail network to bedeveloped from mines to nearest railway sidings by 11 mines in Joda region is estimated to be about 64 km. Similarly, in Koira region, total length of rail network/ conveyor system for 8 mines (under SOTM 1 & 2) is estimated to be around 95km.Further,itissuggestedtodeveloparailnetworkconnectingBanspani(Joda region) and Roxy railway sidings in Koira region. Responsibility: Dept. of Steel & Mines, Govt. of Odisha and Concerned Mines along with Indian Railways. Time Period: Maximum 7 years (by 2025). The Department of Steel &Mines, Govt. of Odishashould follow-up with the concerned Departments and railways so that proposedproper rail network is in place by2025.

19) State Govt. of Odisha shall make all efforts to ensure exhausting all the iron & manganese ore resources in the existing working mines and from disturbed mining leases/zones in Joda and Koira region. The criteria suggested shall be applicable while suggesting appropriate lease area and sustainable mining rate. Responsibility: Dept. of Steel &Mines, Govt. ofOdisha

20) Large and medium mine leases contribute to better implementation of reclamation and rehabilitation plans to sustain the ecology for scientific and sustainable mining. The small leases do not possess scientific capability of environmentally sustainable mining. Therefore, new mine leases having more

than 50 ha area should be encouraged, as far as possible. This will ensure inter-generational resource availability to some extent. Responsibility: Dept. of Steel &Mines, Govt. ofOdisha.

21) **MiningOperations/ProcessRelated:**(i)Appropriatemining processandmachinery (viz. right capacity, fuel efficient) should be selected to carry out various mining operationsthatgenerateminimaldust/airpollution,noise,wastewaterandsolidwaste. e.g. drills should either be operated with dust extractors or equipped with water injection system. (ii) After commencement of mining operation, a study should be conducted to assess and quantify emission load generation (in terms of air pollution, noise, waste water and solid waste) from each of the mining activity (including transportation) on annual basis. Efforts should be made to further eliminate/ minimize generation of air pollution/dust, noise, wastewater, solid waste generation in successive years through use of better technology. This shall be ensured by the respective mine lease holders. (iii) Various machineries/equipment selected (viz. dumpers, excavators, crushers, screen plants etc.) and transport means should have optimum fuel/power consumption, and their fuel/power consumption should be recorded on monthly basis. Further, inspection and maintenance of all the machineries/ equipment/ transport vehicles should be followed as per manufacturer's instructions/ recommended time schedule and record should be maintained by the respective mine lease holders. (iv) Digital processing of the entire lease area using remotesensingtechniqueshouldbecarriedoutregularlyoncein3yearsformonitoring land use pattern and mining activity taken place. Further, the extent of pit area excavated should also be demarcated based on remote sensing analysis. This should be done by ORSAC (Odisha Space Applications Centre, Bhubaneswar) or an agency of national repute or if done by a private agency, the report shall be vetted/ authenticated by ORSAC, Bhubaneswar. Expenses towards the same shall be borneby the respective mine lease holders. Responsibility: Individual Mine LeaseHolders

22) **Air Environment Related:** (i) Fugitive dust emissions from all the sources should be controlled regularly on daily basis. Water spraying arrangement on haul roads, loading and unloading and at other transfer points should be provided and properly maintained.Further,itwillbedesirabletousewaterfoggingsystemtominimizewater consumption. It should be ensured that the ambient air quality parameters conformto the norms prescribed by the CPCB in this regard. (ii) The core zone of mining activity should be monitored on daily basis. Minimum four ambient air quality monitoringstations should be established in the core zone for SPM, PM10, PM2.5, SO2, NOxand CO monitoring. Location of air quality monitoring stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the

State Pollution Control Board (based on Emission Load Assessment Study). The number of monitoring locations may be more for larger capacity mines and working in larger area. Out of four stations, one should be onlinemonitoring station in the mines having more than 3 MTPA EC Capacity. (iii)Monitoringin buffer zone should be carried out by SPCB or through NABET accredited agency.In addition, air quality parameters (SPM, PM10, PM2.5, SO2, NOx and CO) shall be regularly monitored at locations of nearest human habitation including schools and other public amenities located nearest to source of the dust generation as applicable. Further, 11 continuous air quality monitoring systems may be installed in Joida and Koira regions and one in Baripada/ Rairangpur region. (iv) Emissions from vehicles as well as heavy machinery should be kept under control and regularly monitored. Measures should be taken for regular maintenance of vehicles used in mining operations and in transportation of mineral. (v) The vehicles shall be covered with atarpaulin and should not be overloaded.Further, possibility of 3using closed containertrucks should be explored for direct to destination movement of iron ore. Air quality monitoring at one location should also be carried out along the transport route within the mine (periodically, near truck entry and exit gate).Responsibility: Individual Mine Lease Holders andSPCB.

23) **NoiseandVibrationRelated:**(i)Blastingoperationshouldbecarriedoutonlydu ring daytime. Controlled blasting such as Nonel, should be practiced. The mitigation measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented. (ii) Appropriate measures (detailed in Section 5.4) should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs/muffs. (iii) Noise levels should be monitored regularly (on weekly basis) near the major sources of noise generation within the core zone. Further, date, time and distance of measurement should also be indicated with the noise levels in the report. The data should be used to map the noise generation from different activities and efforts should be made to maintain the noise levels with the acceptable limits of CPCB (CPCB, 2000) (iv) Similarly, vibration at various sensitive locations should be monitored atleast once in month, and mapped for any significant changes due to successive mining operations. Responsibility: Individual Mine LeaseHolders.

24) Water/Wastewater Related : (i) In general, the mining operations should be restricted to above ground water table and it should not intersect groundwater table. However, if enough resources are estimated below the ground water table, the same may be explored after conducting detailed geological studies by GSI and hydro- geological studies by CGWB or NIH or institute of national repute, and ensuring that no damage to the land stability/ water aquifer system shall happen. The details/ outcome of such study may be reflected/incorporated in the EIA/EMP report of themine appropriately. (ii) Natural watercourse and/or water resources should not be obstructed due to any mining operations. Regular monitoring of the flow rate

of the springs and perennial nallas should be carried out and records should be maintained. Further, regular monitoring of water quality of nallas and river passing thorough the mine lease area (upstream and downstream locations) should be carried out on monthly basis. (iii) Regular monitoring of ground water level and its quality should be carried out within the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring should be carried out on monthly basis. (iv) In order to optimize water requirement, suitable conservation measures to augment ground water resources in the area should be undertaken in consultation with Central Ground Water Board (CGWB). (v) Suitable rainwater harvesting measures on long term basis should be planned and implemented in consultation with CGWB, to recharge the ground water source. Further, CGWB can prepare a comprehensive plan for the whole region. (vi) Appropriate mitigation measures (viz. ETP, STP, garland drains, retaining walls, collection of runoff etc.) should be taken to prevent pollution of nearby river/other water bodies. Water quality monitoring study should be conducted by State Pollution Control Board to ensure quality of surface and ground water sources on regular basis. The study can be conducted through NABL/ NABET approved water testing laboratory. However, the report should be vetted by SPCB. (vii) Industrial wastewater (workshop and wastewater from the mine) should be properly collected, treated in ETP so as to conform to the discharge standards applicable. (viii) Oil and grease trap should be installed before discharge of workshop effluents. Further, sewage treatment plant should be installed for the employees/colony, wherever applicable. (ix) Mine lease holder should ensure that no silt originating due to mining activity is transported in the surface water course or any other water body. Appropriate measures for prevention and control of soil erosion and management of silt should be undertaken. Quantity of silt/soil generated should be measured on regular basis for its better utilization. (x) Erosion from dumps site should be protected by providing geo-textile matting or other suitable material, and thick plantation of native trees and shrubs should be carried out at the dump slopes. Further, dumps should be protected by retainingwalls.(xi)Trenches/garlanddrainshouldbeconstructedatthefootofdumps to arrest silt from being carried to water bodies. Adequate number of check dams should be constructed across seasonal/perennial nallas (if any) flowing through the mine lease areas and silt be arrested. De-silting at regular intervals should be carried out and quantity should be recorded for its better utilization, after proper soil quality analysis. (xii)The water so collected in the reservoir within the mine should be utilized for the sprinkling on hauls roads, green belt development etc. (xiii) There should be zero waste water discharge from the mine. Based on actual water withdrawal and consumption/ utilization in different activities, water balance diagram should be prepared on monthly basis, and efforts should be made to optimize consumption of water per ton of ore production in successive years.

Responsibility: Individual Mine Lease Holders, SPCB andCGWB.

25) **Land/ Soil/ Overburden Related** (i) The top soil should temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long (notmore than 3 years or as per provisions mentioned in the mine plan/ scheme). The topsoil should be used for land reclamation and plantation appropriately. (ii) Fodder plots should be developed in the non-mineralised area in lieu of use of grazing land, if any. (iii) Over burden/ low grade ore should be stacked at earmarked dump site(s) only and should not be kept active for long period. The dump height should be decided on case to case basis, depending on the size of mine and quantity of waste material generated. However, slope stability study should be conducted for larger heights, as perIBMapprovedmineplanandDGMSguidelines.TheOBdumpshouldbescientificall y vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles should be undertaken for stabilization of the dump. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self-sustaining. Proper records should be maintained regarding species, their growth, area coverage etc. (iv) Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from mine operation, soil, OB and mineral dumps. The water so collected can be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly de-silted, particularly after monsoon and should be maintained properly. Appropriate documents should be maintained. Garland drain of appropriate size, gradient and length should be constructed for mine pit, soil. OB and mineral dumps and sump capacity should be designed with appropriate safety margin based on long term rainfall data.Sump capacity should be provided for adequate retention period to allow proper settling of silt material. Sedimentation pits should be constructed at thecornersofthegarlanddrainsandde-siltedatregularintervals.(v)Backfillingshould be done as per approved mining plan/scheme. There should be no OB dumps outside the mine lease area. The backfilled area should be afforested, aiming to restore the normal ground level. Monitoring and management of rehabilitated areas should continuetill thevegetationisestablishedandbecomesself-generating.(vi)Hazardous waste such as, waste oil, lubricants, resin, and coal tar etc. should be disposed off as per provisions of Hazardous Waste Management Rules, 2016, as amended from time to time. Responsibility: Individual Mine LeaseHolders.

26) **Ecology/Biodiversity (Flora-Fauna) Related:** (i) As per the Red List of IUCN (International Union for Conservation of Nature), six floral species and 21 faunal species have been reported to be under threatened, vulnerable & endangered category. Protection of these floral and faunal species should be taken by the State Forest & Wildlife Department on priority, particularly in the mining zones, if any. (ii) The mines falling within 5-10 km of the Karo-Karampada Elephant corridor buffer need to take precautionary

measures during mining activities. The forest and existing elephant corridor routes are to be protected and conserved. Improvement of habitat by providing food, water and space for the elephants is required to be ensured to avoid Man-Elephant conflicts. Though as per the records of State Forest Department, movement of elephants in the Karo-Karampada elephant corridor within 10 km distance from the mines in Joda and Koira is not observed, the Forest Department shall further record and ensure that elephant's movement is not affected due to mining activities. (iii) All precautionary measures should betaken during mining operation for conservation and protection of endangered faunanamely elephant, sloth bear etc. spotted in the study area. Action plan for conservation of flora and fauna should be prepared and implemented in consultation with the State Forest and Wildlife Department within the mine lease area, whereas outside the mine lease area, the same should be maintained by State Forest Department. (iv) Afforestation is to be done by using local and mixed species saplings within and outside the mining lease area. The reclamation and afforestation is to be done in such a manner like exploring the growth of fruit bearing trees which will attract the fauna and thus maintaining the biodiversity of the area. As afforestation done so far is very less, forest department needs to identify adequate land and do afforestation by involving local people in a time bound manner. (v) Green belt developmentcarriedoutbyminesshouldbemonitoredregularlyineveryseasonand parameters like area under vegetation/plantation, type of plantation, type of tree species /grass species/scrubs etc., distance between the plants and survival rate should be recorded. (vi) Green belt is an important sink of air pollutants including noise. Development of green cover in mining area will not only help reducing air and noisepollutionbutalsowillimprovetheecologicalconditionsandpreventsoilerosion to a greater extent. Further, selection of tree species for green belt should constitute dust removal/dust capturing plants since plants can act as efficient biological filters removing significant amounts of particulate pollution. Thus, the identified native trees in the mine area may be encouraged for plantation. Tree species having small leaf area, dense hair on leaf surface (rough surface), deep channels on leaves should be included for plantation. (vii) Vetiver plantation on inactive dumps may be encouraged as the grass species has high strength of anchoring besides medicinal value. (viii) Details of compensatory afforestation done should be recorded and documented by respective forest divisions, and State Forest Department should presentmine-wiseannualstatus,alongwithexpendituredetails.(ix)Similarly,Wildlife Department is also required to record and document annual status of wildlife in the region and should identify the need for wildlife management on regional level. (x) Maintenance of the ecology of the region is prime responsibility of the State Forest and Wildlife Department. They need to periodically review the status and identify the need for further improvement in the region. The required expenditure may be met from the funds

already collected in the form of compensatory afforestation and wildlife management. Further, additional fund, if required can be sought from DMF. Responsibility: Individual Mine Lease Holders and State Forest & Wildlife Department.

27) **Socio-Economic Related:** (i) Public interaction should be done on regular basis and social welfare activities should be done to meet the requirements of the local communities. Further, basic amenities and infrastructure facilities like education, medical,roads,safedrinkingwater,sanitation,employment,skilldevelopment,training institute etc. should be developed to alleviate the quality of life of the people of the region.(ii)Landouteesandlandlosers/affectedpeople,ifany,shouldbecompensated andrehabilitatedasperthenational/statepolicyonResettlementandRehabilitation. (iii) The socio-economic development in the region should be focused and aligned with the guidelines/initiatives of Govt. of India/ NITI Aayog / Hon'blePrime Minister's Vision centring around prosperity, equality, justice, cleanliness, transparency, employment,respecttowomen,hopeetc.Thiscanbeachievedbyprovidingadequate and quality facilities for education, medical and developing skills in the people of the region. District administration in association with mine lease holders should plan for *"Samagra Vikas"* of these blocks well as other blocks of the district. While planning for different schemes in the region, the activities should be prioritized as per Pradhan Mantri Khanij Kshetra Kalyan Yojna (PMKKKY), notified by Ministry of Mines, Govt. of India, vide letter no. 16/7/2017-M.VI (Part), dated September 16, 2015. Responsibility: District Administration and Individual Mine LeaseHolders.

28) **Road Transport Related:** (i) All the mine lease holders should follow the suggested oretransportmode(SOTM),basedonitsECcapacitywithinnext5years.(ii)Themine lease holders should ensure construction of cement road of appropriate width from and to the entry and exit gate of the mine, as suggested in Chapter 10. Further, maintenance of all the roads should be carried out as per the requirement to ensure dust free road transport. (iii) Transportation of ore should be done by covering the trucks with tarpaulin or other suitable mechanism so that no spillage of ore/dusttakes place. Further, air quality in terms of dust, PM10 should be monitored near the roads towards entry &exit gate on regular basis, and be maintained within the acceptable limits. Responsibility: Individual Mine Lease Holders and Dept. of Steel &Mines

29) **Occupational Health Related:** (i) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequatetraining and information on safety and health aspects periodically. (ii) Occupational health surveillance program for all the employees/workers (including casual workers) should be undertaken

periodically (on annual basis) to observe any changes due to exposure to dust, and correctivemeasures should be taken immediately, if needed. (iii) Occupational health and safety measures related awareness programsincluding identification of work related health hazard, training on malaria eradication, HIV and health effects on exposure to mineral dust etc., should be carried out for all the workers on regular basis. A full time qualified doctor should be engaged for the purpose. Periodic monitoring (on 6 monthly basis) for exposure to respirable minerals dust on the workers should be conducted, and record should be maintained including health record of all the workers. Review of impact of various health measures undertaken (at an interval of 3 years or less) should be conducted followed by follow- up of actions, wherever required. Occupational health centre should be established near mine site itself. Responsibility: Individual Mine Lease Holders and District Administration (District MedicalOfficer)

30) **Reporting of Environmental Sustainability Achievement:** All the mines should prepare annual environmental sustainability report (ESR), highlighting the efforts made towards environmental protection with respect to different environmental components vis-à-vis production performance of the mine on monthly basis. The data collected as per EC and CTE/CTO conditions should be utilized to prepare the annual sustainability report. The mines performing high with effective environmental safeguards may be suitably recognized/rewarded. "Star Rating Format" formulated by the Ministry of Mines along with environmental sustainability report may beused.

31)**Environmental Monitoring Requirements at Regional Level:** Apart from strict compliance and monitoring by individual mine lease holder, there is a need for simultaneous monitoring in each of the regions by competent expert agencies under the guidance/ supervision of concerned regulatory agency. Details of the studies required to be done on regular basis (continuously for 5 years) through responsible agency (organization of national/state repute) and time frame are suggested inTable.

Table:SuggestedEnvironmentalMonitoringRequirementsandActionPlansatRegional Level

Sr. No.	Study Component/ Action Plan	Responsibility	Monitoring and Reporting TimeFrame (Approx.)
1.	Environmental Quality Monitoring with respect to Air, Water, Noise and Soil Quality in each region (Joda, Koira and Baripada/Rairangpur) as per specified frequency shall be done by a third party (preferably Govt.) and/or laboratory approved/ recognized by NABET/CPCB/	SPCB	Continuous Annually

	SPCB/ MoEF&CC.		
	All the water bodies (rivers, nallas, ponds etc.) shall be monitored. National/Statelevel research/ academic institutes may be involved initially for couple of years to streamline the activity. The report shall be brought out annually by June each year. The study shall be conducted inconsultation with MoEF&CC-RO.		
	Installation of online ambient air qualitymonitor for PM10, PM2.5, SOx and NOxwithintheminehavingmorethan3MTPAEC Capacity	RespectiveMine LeaseHolders	ContinuousAnnually
	Installation of online ambient air quality monitor for PM10, PM2.5, SOx and NOx in the Joda and Koira Region (total 11 locations.	SPCB	Continuous Annually
2.	Status of flora and fauna in each of the regions shall be assessed on annual basis. Changes, if any, taking place in the region shall be brought out clearly. The study shall be conducted in consultation with State Forest and Wildlife Department.	State & Forest Dept. Wildlife	Annually in mining zone and once in 3 years in the region
3.	Socio-economic study incorporating developments taking place in each of the region, CSR initiatives made by the mining companies shall be conducted on annual basis. Further, micro level developmental needs shall be clearly brought out in the report for each region. The study shall be conducted in consultation withdistrict administration.	Respective District Administration	Annually
4.	A detailed hydro-geological study in each of the regions shall be conducted in an integrated manner in consultation with Regional Director, Central Ground Water Board. Accordingly, all project proponents	SPCB	Once in 2 years

	shall implement suitable conservation measures to augment ground water resources in the area.		
5.	The State Govt. shall ensure construction and maintenance of dust free common roads/ appropriate rail network for transport of ore from mines to the consumer end.	Dept. of Steel & Mines	12 months for road network and 5-7 years for rail network
6.	Construction and maintenance of dust free roads from respective mine to the main road	Respective Mine Lease Holders	Continuous 6 months
7.	Traffic/road inspection study addressing the condition of traffic/roads leading to different mines and connecting to different railway sidings shall be undertaken on annual basis. Further, detailed traffic study shall be undertaken on every 5 yearly basis to ensure adequacy of road/rail infrastructure in each of the regions. The study can be undertaken through national/ state level research/ academic institute (such as CSIR- CRRI, New Delhi).	Dept. of Steel & Mines	Continuous 6 months
8.	Assessment of land use/ land cover changes in each of the regions, with particular focus on mining areas, afforestation activities, variation in flow path of various water bodies etc. using remote sensing data	ORSAC	Annually
9.	R&D Studies for utilization of low-grade iron ore	Dept. of Steel & Mines through R&D / Academic Institutes	Up to 45% by 2020 and Up to 40% by 2025

The data so generated for the region should be made available on the website of DepartmentofSteel&MinesandalsoatMoEF&CCwebsite,sothatitcanbeeffectively utilizedbyIndividualMineLeaseHoldersforpreparingEIA/EMPreports.Thiswillmeet therequirementforseparateoneseasonbaselineenvironmentalqualitydatacollection bytheindividualproponents,ifthemineproposedisinthesamestudyregion.Further,MoEF &CC (through EAC) can also utilize the data base available in evaluating theproposals for expansion of existing mines or new mines while granting ToR or EC tothe mine, taking an holistic view of the region. State Govt. of Odisha should bring out an integrated environmental sustainability report for each of the regions (mainly for Joda and Koia region) incorporating ESR of individual mines and data

collected in the region through various agencies, once in 5 years, to plan level of scientific and sustainable mining for the next 5years.

32) Institutional Mechanism for Implementation of Environmentally Sustainable Mining: The present study is not a one-time study, but a process to ensure environmentally sustainable mining activities in the region on long term basis. Looking into the large-scale mining activities and long term perspective for mining vis-à-vis environmentally sustainable mining and upliftment of people of the region, there is a need to create an agency, who will integrate all the aspects relating to sustainable mining in the region on long term basis. It could be a SPV of Govt. of Odisha or a cell within the overall control and supervision of Dept. of Steel &Mines, with members from IBM, GSI, OSPCB, MoEF&CC-RO and other concerned Departments and Mine Owners (EZMA), District Administration. It is found that the strong database available for the region needs to be taken into account to map and establish environmental quality of the region on daily, monthly, seasonal and annual basis. Further, the efforts and initiatives of the mines towards environmentalprotectionaswellasupliftmentofthepeopleoftheregionarerequired to be integrated, and a systematic plan at the block/regional level needs to be framedfortheoverallbenefitofthelocalsociety,region,district,stateandthecountry as a whole. It will be desirable to haveproper environmental quality data managementandanalysisbyNEERIoranyotheragencyfornext5years(sixmonthly compliance reports followed by field verification) ensuring sustainable mining practicesintheregionleadingtoanoveralldevelopmentoftheregion.DistrictMineral Funds should be utilized appropriately for various developmental activities/needs of the region. Further, an environmental sustainability report incorporating environmental status of region coupled with social upliftment may be brought out by SPCB or any other authorized agency on annual basis. This report can be used for supporting the regional EIA study, and also need for environmental quality monitoring by individual mine seeking environmental clearance for new mine/ expansion of mine, including public hearing. Since, outcome of the above study reports shall be in the overall interest of all the stakeholders (including local population) of the region, further planning for the region shall warrant cooperation andassistanceofallthestakeholders(mineoperators,industries,transporters,State &CentralGovernmentOffices,MoEF&CC,CPCB,SPCB,Dept.ofSteel&Mines,IBM, IMD, NGOs and local people) in sharing the relevant data/information/ reports/documents etc. to continuously improve upon the environmentally sustainable development plan for economic growth in mining sector as well as for improvement in quality of life of the people of theregion.

13. Besides the above, the below mentioned general points are also to be followed: -

a) All documents to be properly referenced with index and continuous page numbering.
b) Where data are presented in the Report especially in Tables, the period in

which the data were collected and the sources should be indicated.

c) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.

d) Where the documents provided are in a language other than English, an English translation should be provided.

e) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.

f) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.

g) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attentionof MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structureand content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.

h) As per the circular no. J-11011/618/2010-IA.II (I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.

14. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

15. The prescribed TOR would be valid for a period of four years for submission of the EIA/EMP report, as per the O.M. No. J-11013/41/2006-IA. II (I) dated 29.08.2017 and as per the notification S.O. 751(E) 17th February, 2020. The instant TOR is valid up to four years from the date of issue of the ToR.

16. After preparing the draft EIA (as per the generic structure prescribed in Appendix- III of the EIA Notification, 2006) covering the above mentioned issues, the proponent will get the public hearing conducted and take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

17. This issues with the approval of Competent Authority.

Yours faithfully,

(PankajVerma)
Scientist 'E'
Email- pankaj.verma@nic.in
Tel./Fax- 011-24695264

Copy to:

1). **The Secretary,** Ministry of Mines, Government of India ShastriBhawan, NewDelhi.
2). **The Chief Secretary,** Government of Odisha, Secretariat, Bhubaneswar.
3). **The Secretary,** Department of Environment, Government of Odisha, Secretariat, Bhubaneswar.
4). **The Secretary,** Department of Mines and Geology, Government of Odisha, Secretariat, Bhubaneswar.
5). **The Secretary,**Department of Forests, Government of Odisha, Secretariat, Bhubaneswar.
6). **The Secretary,** Department of Steel and Mines, Government of Odisha, Secretariat, Bhubaneswar.
7). **The Member Secretary,**Odisha State Pollution Control Board, PariveshBhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
8). **The Additional Principal Chief Conservator of Forests (C),** Ministry of Environment, Forest and Climate Change, Regional Office (EZ), A/3, Chandrasekharpur Bhubaneswar -751023.
9). **The Chief Wildlife Warden,** PrakurtiBhawan, 5th floor, BDA Apartment, Nilakanthanagar, Nayapalli, Bhubaneswar-751012, Odisha.
10). **The Chairman,** Central Pollution Control Board, PariveshBhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi–110032.
11). **The Controller General,** Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440001
12). **The Member Secretary,** Central Ground Water Board, Ministry of Agriculture and Irrigation,12/1 Jam Nagar House, Shahjahan road, New Delhi 110011.
13). **The District Collector,** Keonjhar District, Govt. of Odisha.
14). **Guard File.**
15). **Parivesh Portal.**

(PankajVerma)
Scientist 'E'

Annexure –A-I

ESTIMATE FOR SOLAR FENCING

400 pillars per Km.

a)	Earth exaction of foundation in hard soil with initial lead of 50 mtr. And lift of 1.5mtr. and finishing the base = 400 nos. x 0.45 mtr. Length x 0.40 mtr. Depth x 0.25 mtr. Width = 18.00cum. @ Rs. 133.73/-per cum =	Rs.	2407.14
b)	Fixing of pillars with 4 cm. Hg. Metals in cm 1:4:8 Pit size – 400 nos. x 0.45 mtr. x 0.40 mtr. x 0.25mtr. = 18.00 cum. 18cum – 6 cum = 12 cum x Rs. 3755.40 per cum =	Rs.	45064.80
c)	Construction of RCC pillar (1:2:4) cement concrete works of 400 nos. 0.35 length x 0.075 m width x 0.2m height x 400 nos. = 2.1 cum 400 x 1.5mtr. x $\frac{0.1mtr+0.075mtr.}{2}$ x 0.075 mtr. = 3.94cum. **Total = 6.04 cum** Cost of 400 pillars = 6.04 cum x @ Rs. 5721.97/cum =	Rs.	32748.69
d)	Cost of rods including cutting, bending & binding of 6.04 cum x 0.90 qtl. M.s rod = 5.436 qtl. @ Rs. 10595.80 per qtl. =	Rs.	57598.77
e)	Contingency including curing, stacking and provision of insulator hooks etc on L.S =	Rs.	14800.00
f)	Stand wire : 5 steps – 1000 x 5 = 5000 rmt. = 1875 kg. x @ Rs. 85/- per kg.	Rs.	159375.00
g)	Labour for straightening of the stand wire fixing and clipping with pillars – 50MD per KM. @ Rs. 311/- per MD =	Rs.	15550.00
h)	Carriage of RCC pillars and stand wire from Range Office Campus to work site @ Rs. 1,000 per TLD and cost of loading and unloading with 5 KM distance approximately – 8 TLD @ Rs. 800/- per TLD =	Rs.	14400.00
	Total	**Rs.**	**341944.40** or **341945.00**

Besides above on energizer is required for each site with maximum periphery of 3 KM length cost of energizer is Rs. 55,000/- including GST.

Annexure-B-I

Cost norm for fire-fighting squad Consisting 5 members
Wage rate Rs. 311/- per day

1. Wages of 5 nos. of squad – i.e 5 x 311 x 30 x 5	Rs. 2,33,250.00
2. Hire charge of vehicle	Rs. 2,25,000.00
3. Contingency i.e mobile recharge	Rs. 2,900.00
Total	**Rs. 4,61,150.00**

(Rupees four lakhs sixty one thousand one hundred fifty) only.

Annexure-B-II

CAMPA APO: 2021-2022

COST STRUCTURE FOR DIFFERENT SQUADS

(Wage rate @ Rs. 311/-Md)

SL No.	Items of works	Amount (In rupees)
1	**Wildlife Protection /Anti depredation squard Consisting of 5 members**	
	a) Wages of squad members @ Rs.12,627/-month/, person 12627/- x 12 x 5 =7,57,620/-squad	7,57,620/-
	b) Hire charges of Vehicles/ BOATS/ TRAWLERS	3,72,000/-
	c) @Rs.31,000/- PM X12 month = 3,72,000/-	1,44,000/-
	d) Recharging of Mobiles @ Rs.500/month/squad 500 X 12 X1 =6,000/- per squad	6,000/-
	e) Contingent Expenditure	35,000/-
	Total	**13,14,620/-**

(**Rupees thirteen lakhs fourteen thousand six hundred twenty**) only.

Annexure – B-III

DETAIL COST ESTIMATE FOR EXCAVATION OF ELEPHANT PROOF TRENCH ALONG THE BOUNDARY

Cost estimate for 1 rkm.
Size : Top width 3 mtr., Bottom width 1 mtr., depth 2.5 mtr.
Wage rate @ Rs. 311/- per day.

Sl No.	Work Description	Unit	Quantity	Rate	Amount
1	Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned, up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness.	sqm	5000	7.775	38,875.00
2	Earth work in hard soil or gravelly soil within 50m. Initial lead and 1.5m initial lift including rough dressing and breaking clods to maximum 5cm to 7cm and laying in layers not exceeding 0.3m in depth and as per the direction of the Engineer-in-charge.	cum	3600	1.877	6,757.20
3	Earth work in stoney earth and gravels mixed with stone and boulder not exceeding 0.014cum in volume within 50m. Initial lead and 1.5m initial lift including rough dressing and breaking clods to maximum 5cm to 7cm and laying in layer not exceeding 0.3m in depth and as per specification approved by the department	cum	1400	293.228	4,10,519.20
4	Extra lift of 1.5m or part there of over the initial lift of 1.5m in all kinds of embankments and road works and ordinary earth work in general. 1st Extra lift of 1.5m (upto 7.5m)	cum	1400	14.994	20,991.60
5	Ramming or rolling eath work with light H.R.R. in embankment in layers not exceeding 0.3m over	cum	5000	5.553	27,765.00
6	Fine dressing of earth work in ordinary or hard soil in road format on according to the direction of the department including cutting or filling earth upto 0.15m depth of surface.	sqm	5380	3.609	19,416.42
	Total				**5,24,324.42**
	Labour Cess 1%				5243.2442
	Grand Total				**5,29,567.66** or **5,29,568.00**

(Rupees five lakhs twenty nine thousand five hundred sixty eight) only

Annexure-B-IV

ANNEXURE-4

BASE COST NORM FOR COMPENSATORY AFFORESTATION (BLOCK PLANTATION)
@ 1000 PLANTS PER HECTARE (18 months old seedling)

WAGE RATE Rs- 311/- PER MANDAY

Sl. No	Items of work	Preferable Period of Execution	No of Mandays	Labour Cost (In Rs.)	Matrial Cost (In Rs.)	Total cost (In Rs.)
1	2	3	4	5	6	7
	0th Year (Advance work) Pre-Planting Operation					
1	Survey, Demarcation and Pillar posting	Nov/Dec	2	622	0	622
2	Preparation of Treatment Map (Digital Map)	Nov/Dec	1	311	100	411
3	Site preparation (Cleaning & removal of debrises)	Nov/Dec	12	3732	0	3732
4	Creation of 4.00 mt wide Inspection Path	Feb/Mar	1	311	0	311
5	Alignment and stacking of pits	Feb/Mar	1	311	0	311
6	Digging of pits (45 cm x 45 cm X 45 cm) in hard and gravelly soil	Feb/Mar	40	12440	0	12440
7	Construction of Temporary Labour Shed, Drinking water facility and First-Aid etc.	Jan/Mar	0	0	3500	3500
	Total		57	17727	3600	21327
	1st Year/Planting Year					
1	Refilling of pits by altering the dugout soil of the pits, application of organic compounds/ CDM/ FYM & mixing the same properly.	Jun/Jul	7.5	2332.50	5000	7332.50
2	Transportation of 18 months old polythene bag seedlings in hired truck /tractor from the Permanent/Mega nursery to planting site including loading & unloading. (Average lead of 10 Rkm) & stacking the seedling @ Rs.6/- per Seedling. (1100 nos.)	Jul/Aug	0	0	6600	6600
3	Watering polypot seedlings at planting site	Jul/Aug	2	622	0	622
4	Conveyance of polypot seedlings on head load from the stacking site to individual dugout pits within the planting site, applying insecticide, fertilizers & planting after scooping the soil with other applied materials & pressing the soil perfectely around the planted seedlings.	Jul/Aug	22.5	6997.50	0	6997.50
5	Cost of Fertilizer & Insecticide (a)NPK/Bio-fertilizer @ 50 gms/plant as basal dose = 50kg @ Rs.30/- per kg = Rs. 1500.00 (b) Urea/Vermicompost/Mo Khata/any other fertilizer in two subsequent doses @ Rs. 750.00 (c) Insecticide/ Bio-pescticide @ 5 gms/plant=5 kg @ Rs.150/- per kg = Rs. 750.00	Jul/Aug	0	0	3000	3000
6	Casualty Replacement @ 10% (100 nos.)	Jul/Aug	2.5	777.5	0	777.5
7	1st weeding & Manuring	Aug/Sept	12	3732	0	3732
8	2nd Weeding, Soil working (1mt. diametre around the plants) & Manuring	Oct/Nov	15	4665	0	4665
9	Fire line tracing (2 m. wide fire line over 400 m long) including maintenance of inspection path	Feb/Mar	3	933	0	933
10	Watch & Ward including watering as per requirement	Aug-Mar	12	3732	0	3732
	Total		76.50	23791.50	14600.00	38391.50
	2nd Year Maintenance					
1	Transportation of 100 seedlings from Nursery to plantation site including loading, unloading & conveyance by Tractor @ Rs.6/- per seedling	Jul	0	0	600	600
2	Casualty replacement- 10%	Jul	2.5	777.5	0	777.5
3	Cost of Fertilizer & Insecticide: A) Cost of Insecticide/ Bio-pesticide @ 5 gms/plant = 0.5 Kg @ Rs.150/- per kg = Rs.75/- B)Urea/NPK/Bio-fertilizer/Vermicompost/Mo Khata/any other fertilizer @Rs. 2800/-	July/Aug	0	0	2875	2875
4	Weeding (Complete weeding), Manuring & Soil working (1mt. diametre around the plants)	Sep/Oct	15	4665	0	4665
5	Fire line tracing (2 m. wide fire line over 400 m long) including maintenance of inspection path	Feb/Mar	3	933	0	933
6	Watch & Ward including watering as per requirement	Apr-Mar	18	5598	0	5598
7	Maintenance of Temporary Labour Shed, Drinking water facility and First Aid etc.	Apr-Mar		0	1000	1000
	Total		38.5	11973.5	4475	16448.5

Sl. No	Items of work	Preferable Period of Execution	No of Mandays	Labour Cost (In Rs.)	Matrial Cost (In Rs.)	Total cost (In Rs.)
1	2	3	4	5	6	7
	3rd Year Maintenance					
1	Cost of Fertilizer(Urea/NPK/Bio-fertilizer/Vermicompost/Mo Khata/any other fertilizer	July/Aug	0	0	2800	2800
2	Weeding (Complete weeding), Manuring & Soil working, (1mt. diametre around the plants)	Sep/Oct	15	4665	0	4665
3	Fire line tracing (2 m. wide fire line over 400 m long) including maintenance of inspection path	Feb/Mar	3	933	0	933
4	Watch & Ward including watering as per requirement	Apr/Mar	18	5598	0	5598
5	Maintenance of Temporary Labour Shed, Drinking water facility and First Aid etc.	Apr/Mar	0	0	1000	1000
	Total		**36.0**	**11196**	**3800**	**14996**
	4th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m long) including maintenance of inspection path	Feb/Mar	3	933	0	933
2	Watch & Ward including maintenece of vegetative fencing	Apr-Mar	18	5598	0	5598
	Total		**21**	**6531**	**0**	**6531**
	5th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933.00	0	933
2	Watch & Ward	Apr/Mar	18	5598.00	0	5598
	Total		**21**	**6531**	**0**	**6531**
	6th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933.00	0	933.0
2	Pruning of branches, Singling out of multiple shoots	Jan/Mar	3	933.00	0	933.0
3	Watch & Ward	Apr/Mar	18	5598.00	0	5598.0
	Total		**24**	**7464**	**0**	**7464.0**
	7th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933.00	0	933
2	Watch & Ward	Apr/Mar	18	5598.00	0	5598
	Total		**21**	**6531**	**0**	**6531**
	8th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933.00	0	933
2	Watch & Ward	Apr/Mar	18	5598.00	0	5598
	Total		**21**	**6531**	**0**	**6531**
	9th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933.00	0	933
2	Watch & Ward	Apr/Mar	18	5598.00	0	5598
	Total		**21**	**6531**	**0**	**6531**
	10th Year Maintenance					
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
3	Watch & Ward	Apr/Mar	18	5598.00	0	5598
	Total		**21**	**6531**	**0**	**6531**

Year wise Abstract of Cost Norm (showing seedling cost separately)

Sl. No	Items of work	Preferable Period of Execution	No of Mandays	Labour Cost (In Rs.)	Matrial Cost (In Rs.)	Total cost (In Rs.)
1	2	3	4	5	6	7

Sl. No	Year	No. of Mandays	Labour cost (In Rs)	Material Cost(In Rs.)	Monitoring, Evaluation, Learning, Documentation and Other Contingency (5%) of (4+5)	Cost of Seedlings @Rs.50.31 per seedlings	TOTAL COST(In Rs)
1	2	3	4	5	6	7	8
1	0th year	57.0	17727.0	3600.0	973.00	0.00	22300.00
2	1st year	76.5	23791.5	14600.0	1918.50	55341.00	95651.00
3	2nd year	38.5	11973.5	4475.0	821.50	5031.00	22301.00
4	3rd year	36.0	11196.0	3800.0	749.00	0.00	15745.00
5	4th year	21.0	6531.0	0.0	326.00	0.00	6857.00
6	5th year	21.0	6531.0	0.0	326.00	0.00	6857.00
7	6th year	24.0	7464.0	0.0	373.00	0.00	7837.00
8	7th year	21.0	6531.0	0.0	326.00	0.00	6857.00
9	8th year	21.0	6531.0	0.0	326.00	0.00	6857.00
10	9th year	21.0	6531.0	0.0	326.00	0.00	6857.00
11	10th year	21.0	6531.0	0.0	326.00	0.00	6857.00
	Total:	358.0	111338.0	26475.0	6791.0	60372.0	204976.0

Note:

1. Priority must be given to the indigenous local species available nearby to the site of plantation.
2. 10 % indigenous fruit bearing trees must be preferred to Plantation.
3. Site specific Soil conservation work like LBCD, Gully Plugging, Staggered Trench, Contour Trench, Graded Bund, etc. may be taken up
4. Chain link fencing can be adopoted in the CA plantation taken up outside the forest area and Bamboo twigs fencing may be prefered
5. Watering facilites for procurement of water & watering may be adopted as per the availability of water.
6. The Cost Norm of various items can be changed with the approval of the concerned RCCFs keeping the overall cost norm fixed for each Financial Year

APCCF (Forest Diversion & NO, FC Act)

Matrix for Model-I A Conventional CA Plantation (AR) 1000 plants per Ha

In Rupees

Sl. NO.	Commencement Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost (10 Years)
Base Norm		22300	95651	22301	15745	6857	6857	7837	6857	6857	6857	6857											
1	2021-22	22300	100434	24585	18226	8335	8751	10502	9648	10131	10637	11169											234718
2	2022-23		23415	105456	25814	19137	8752	9189	11027	10130	10638	11169	11727										246454
3	2023-24			24586	110729	27105	20094	9190	9648	11578	10637	11170	11727	12313									258777
4	2024-25				25815	116265	28460	21099	9650	10130	12157	11169	11729	12313	12929									271716
5	2025-26					27106	122078	29883	22154	10133	10637	12765	11727	12315	12929	13575								285302
6	2026-27						28461	128182	31377	23262	10640	11169	13403	12313	12931	13575	14254							298567
7	2027-28							29884	134591	32946	24425	11172	11727	14079	12929	13578	14254	14967						314546
8	2028-29								31378	141321	34593	25646	11731	12313	14777	13575	14257	14967	15715					330273
9	2029-30									32947	148387	36323	26918	12318	12929	15516	14254	14970	15715	16501				346788
10	2030-31										34594	155806	38139	28274	12934	13575	16282	14967	15719	16501	17326			364127

APCCF (Forest Diversion & NO, FC Act)

ANNEXURE VI

JSW Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

OFFICE ORDER

Letter No. JSW/S/CO/2023/303

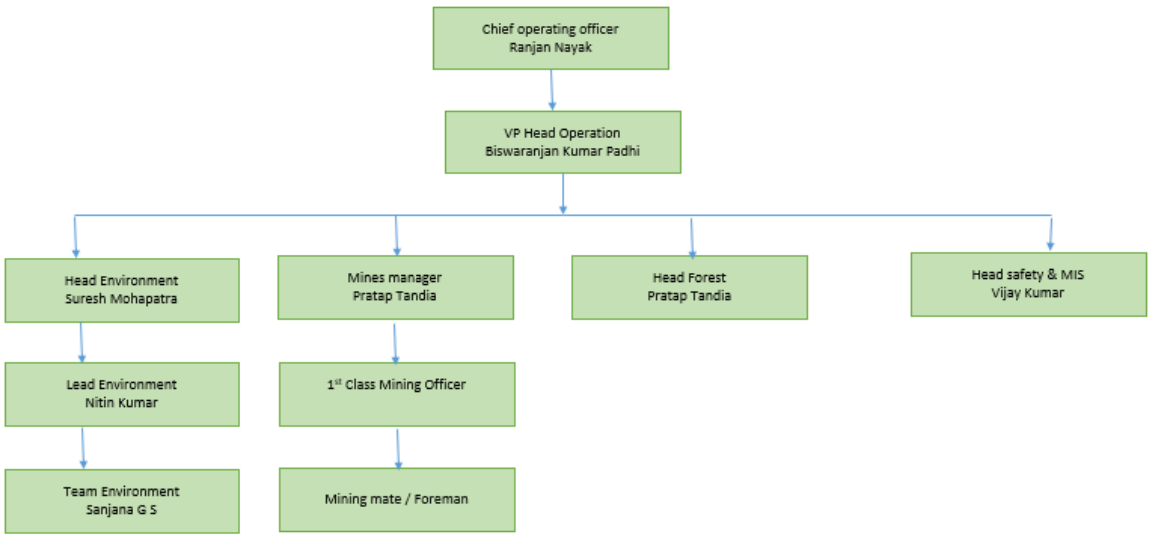
JAJANG IRON ORE MINES

Environment Management Cell

Environment management cell (EMC) working for the management of Environmental monitoring of the mines and to act upon mitigation measures on the impacts of the production of mine with its surrounding environment so that pollution load, water and air quality can be maintained. Key functioning of EMC would be for compliance monitoring and to adhere with Environmental aspects and issues of the project during operation phase. EMC created with an objective of organizational framework for operating Environment Management System (EMS) and other functions of responsibilities for environmental betterment; and formulating Environmental Action Plans (EAPs) which specify mitigation, periodic and annual monitoring activities during project implementation and operation phase of mining.

The potential activities structured for the control mechanism by EMC, such activities are: Air pollution due to the emission of particulate matter, Gaseous pollutants and fugitive emissions; Noise pollution due to various noise generating equipment and mining activities; Wastewater generation from domestic activities; and Solid waste disposal. In order to minimize these impacts and to ensure that the environment in and around the project site as well as the neighboring population is well protected; an effective environment management plan to be developed and maintained by Environment management cell.

Organogram



Ranjan Nayak
Chief Operating Officer

ANNEXURE VII

BY SPEED POST

No. J-11015/96/2012-IA.II (M)
Government of India
Ministry of Environment, Forests & Climate Change
Impact Assessment Division

3rd Floor, Vayu Wing,
Indira Paryavaran Bhawan,
Jorbagh Road, Aliganj,
New Delhi-110 003
Tele: 011-24695304
E-mail: sridhar-mef@nic.in
Dated: the 13th March, 2015

To,

M/s Rungta Mines Limited,
Main Road, Barbil
Distt-Keonjhar
Odisha-758035
Email: rungta _bbl@yahoo.co.in
Fax: 06767-276161

Subject: **Jajang Iron and Manganese Mine of M/s Rungta Mines Limited located at Village Jajang, Joribahal, Palsa (Ka) and Bandhubeda, District Keonjhar, Orissa (666.15 ha). Production of Iron Ore from 5.5 million TPA to 16.5 million TPA (total handling including dry processing) and Installation of Wet Beneficiation Plant of 6.0 Million TPA capacity- Environmental Clearance regarding**

Sir,

This has reference to your letter No. RM/ED/ENV/2011-12/5659 dated 20.03.2012 on the subject mentioned above and subsequent letters dated 09.07.2012, 22.06.2012, 24.01.2014, 12.03.2014 and 09.09.2014. The proposal was considered by the Expert Appraisal Committee in its meeting held on 20 June, 2012 to determine the Terms of Reference (TOR) for undertaking detailed EIA study. The TORs were issued by MoEF vide letter J-11015/96/2012-IA-II(M), dated 23.07.2012. The proposal was considered in the EAC in the meeting held during March 20-21, 2014 wherein the Committee recommended the proposal for environmental clearance.

2. The proposal is for enhancement of production of Iron ore from 5.5 MTPA to 16.5 MTPA (12.8MTPA ROM by fresh excavation + 3.7 MTPA by collection from old dumps/material stacks), installation of Wet Beneficiation Plant of 6 MTPA throughput and pelletisation plant of 2.4 MTPA capacity over an area of 666.15 ha in Jajang, Bandhuabeda, Palsa (ka) and Joribahal villages of District Keonjhar. The proposal of pelletisation plant of 2.4 MTPA capacity has been withdrawn by the PP. The Latitude and Longitude of the site is $21^0$54'43.70"N to $21^0$56'33.50"N and $85^0$24'49.68"E to $85^0$26'50.70"E.

3. The Environmental Clearance for the mine was earlier granted by Ministry of Environment and Forests, Govt. of India vide letter no. J-11015/136/2005-IA-II(M) dated 14.06.2005 for production of 5.5 million TPA of Iron Ore. The Certified Compliance Report by MoEF Regional Office, Bhubaneswar, submitted vide letter no. 101-187/05/EPE dated 18.03.2013 was also discussed during the meeting.

4. The scheme of mining for proposed expansion has been approved by IBM; vide letter No. 314(3)/2011/MCCM (CZ)/MS-49 dated 27.03.2012 for the period 2012-13 to 2016-17. The lease area of 666.150 ha consists of 67.965 ha of Khesra forest land 417.62 ha DLC forest land, 180.565 ha of non-forest land. Out of 67.965 ha of KF, 44.70 ha has received Stage-II clearance and safety zone of 23.265 ha has received Stage-I clearance. Similarly out of 417.620 ha of DLC forest, 379.846 ha (including 4.629 ha safety zone) has already received Stage-I clearance on 19.03.2012. Balance 37.774 ha of DLC forest is acquired by DKB rail line.

5. The proposed method of mining operation in Iron Ore Quarry will be opencast fully mechanized with excavation of waste and ROM Iron ore by excavators. Loading will be done by loaders. ROM ore will be processed through screening and crushing Units to get sized and fines of iron ore. Large boulders of Iron Ore will be broken by using rock breakers to avoid blasting. Dozers will be used for road development and dump development. Transportation of iron ore will be mainly through two Railway sidings within the lease, partly through Railway siding outside lease area (together 80%). The balance 20% material will be transported by road.

6. Total ROM Iron ore production of the mine or already stacked low-grade Iron ore of the mine will be processed by dry screening/crushing dry/magnetic separation/wet beneficiation. Various types of dry processing Units are already under operation in the mine. It is proposed to install (4x500TPH) iron ore wet beneficiation plant after statutory clearances, for a feed capacity of 6.0 MTPA, which will provide 4.5 MTPA of saleable ore per annum. At the proposed production capacity, life of the mine is 8 years.

7. The solid waste generation will be 66,29,129 m^3 and tailings 17,46,030 m^3 during mining scheme period. During life of the mine, waste generation will be 68,50,599 m^3 and tailings 39,68,250 m^3. Existing 92,43,072 m^3 waste is dumped in D1,D2,D3,D4 dumps. Out of 92,43,072 m^3 of dump around 16,77,819 m^3(D1 +D2) of iron ore will be produced after processing. The balance quantity shall be dumped/stacked.Out of 66,29,129 m^3 waste generated during mining scheme period 3260078 will be dumped in external dump D4, balance will be used for backfilling in Block B & C. Tailings of 17,46,030 m^3 will be filter pressed & backfilled near block C, remaining will go to tailing pond. 68,50,599 m3 waste generated during life of mine will be dumped/ backfilled in Block B & C. Tailings of 39,68,250 m^3 will be filter pressed & backfilled near block C, remaining will go to tailing pond. 1,42,33,930 m^3 of waste & tailing shall be backfilled in an area of 225.751 ha & 12.894 ha of tailing pond will be filled by 12,00,000 m3 of tailings.

8. Total Water requirement is 14,231 m^3/day. The quantity of water will be met from Surface water & Ground water. On the basis of the approval by Single Window Clearance Authority (SLSWCA), the Industrial Promotion and Investment Corporation of Orissa Limited(IPICOL) has recommended 480 m^3 of surface water/hr (11,520m^3/day) for the beneficiation plant which includes the water requirement for dust suppression , greenbelt development and miscellaneous work. The total makeup water requirement/ day for plant operation is

10,421m^3/day for which the application is being submitted to Department of Water Resources, Govt. of Odisha for allocation of the said quantity.

9. The present working is from 617 mRL and ultimate working will be up to 467mRL. The water table (Post monsoon) is at 456 mRL. Therefore, mine working will not intersect the water table. The Baitarni river flows adjacent to the mine lease area in East direction. It was reported by PP that no Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor/ Schedule I species occur within 10 km of the mine lease area. For conservation of wildlife in the area, site specific conservation plan is already approved by Principal CCF (Wild Life) & Chief Wild Life Warden, Odisha. However, PP has contributed proportionate amount in preparation of regional Wild Life Management Plan. The proposed fund requirement for implementation of the Plan has already been deposited (Rs. 200 Lakhs) to DFO Keonjhar. All other works within the lease area shall be undertaken by the Company under the guidance of the Monitoring Committee and DFO and a budget of Rs. 100 lakhs has been kept by the Company for implementation of the Plan within lease area.

10. Baseline studies were carried out in October, November, and December, 2012. Public hearing was held on 17.01.2014 at Exhibition ground, near Radhakrishna temple, Jajang village of district Keonjhar, Odisha. Issues raised & the action plan with budgetary allocation is given as: Environmental protection measures (Rs 30 lacs/ annum), Educational facility (Rs.9lacs/annum), Health Care (Rs. 63.5 lacs/ annum), drinking water supply (Rs. 2 lacs/annum),peripheral development(Rs. 6.3 lacs/ annum), dust suppression (Rs. 10 lacs/annum),promotion of culture & sports (Rs. 5 lacs/ annum), support to agriculture (Rs. 5 lacs/annum).

11. The cost of the project is Rs.1400 crores and environmental cost towards EMP already incurred is Rs.1520.93 lakhs & further proposed is Rs. 698.00 lakhs. Proposed recurring cost per year is Rs. 103.08 lakhs. For Peripheral development expenditure already made is Rs. 51.24 crores and proposed recurring expenditure per year is Rs. 2.72 crores. It was informed by PP that there is no court case/litigation pending against the Project and no violation of the rule.

12. The Ministry of Environment and Forests has examined the application in accordance with the EIA Notification, 2006 and hereby accords environmental clearance under the provisions thereof to the above mentioned proposal of Jajang Iron Ore and Manganese Mine of M/s Rungta Mines Limited located at Village Jajang, Palsa (Ka), Joribahal and Bandhubeda, District Keonjhar, Odisha for production of Iron Ore from 5.5 million TPA to 16.5 million TPA (total handling including dry processing) and Installation of Wet Beneficiation Plant of 6.0 Million TPA capacity within mine lease area of 666.15 ha [67.965 ha (forest area for which FC is available) + 379.846 ha of DLC forest for which FC is available + 180.565 ha (non-forest area)] excluding 37.774 ha of forest land acquired by Railways subject to implementation of the following conditions and environmental safeguards.

A. Specific Conditions

(i) The dump height should be maintained upto 60 meter and overall slope of the dump shall be upto 30°.

(ii) The project proponent shall obtain Consent to Establish and Consent to Operate from the State Pollution Control Board, Odisha and effectively implement all the conditions stipulated therein.

(iii) Environmental clearance is subject to obtaining clearance under the Wildlife (Protection) Act, 1972 from the competent authority, as may be applicable to this project.

(iv) The project proponent shall obtain prior approval of the competent authorities for drawl of requisite quantity of surface water and ground water for the project before commencing the mining activity.

(v) No mining activities are allowed in forest area for which the FC is not available.

(vi) The condition 3(iii)b of the the guidelines issued by the Forest Conservation Division in this Ministry vide F. No. 11-362/2012-FC dated 1st February, 2013 is not being prescribed in view of Hon'ble Supreme Court order dated 27.01.2014 and the EC is subject to the final order of the Supreme Court in the matter.

(vii) Traffic density on the route of mineral transportation shall be regularly monitored and report shall be submitted along with compliance report.

(viii) As part of ambient air quality monitoring during operational phase of the project, the air samples shall also be analysed for their mineralogical composition and records maintained.

(ix) Mineral handling plant shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.

(x) Effective safeguard measures such as conditioning of ore with water, regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of particulate matter such as around crushing and screening plant, loading and unloading point and transfer points. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.

(xi) The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.

(xii) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and installing new piezo meters during the mining operation. The periodic monitoring [(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)] shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office Bhubaneswar, the Central Ground Water Authority and the Regional Director, Central Ground Water Board. If at any stage, it is observed that the groundwater table is getting depleted due to the mining activity; necessary corrective measures shall be carried out.

(xiii) The project proponent shall regularly monitor the flow rate of the natural water streams Jalpa, Kakrapani Nallah and Baitarni river and the Suna nadi flowing adjacent to the mine lease and maintain the records.

(xiv) The reclaimed and rehabilitated area shall be afforested. Monitoring and management of rehabilitated areas shall continue until the vegetation

becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis.

(xv) Dimension of the retaining wall at the toe of temporary over burden dumps and OB benches within the mine to check run-off and siltation shall be based on the rain fall data.

(xvi) Plantation shall be raised in an specified area including a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around the higher benches of excavated void to be converted in to water body, roads etc. by planting the native species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per Ha.

(xvii) Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM and RPM such as haul road, loading and unloading point and transfer points. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.

(xviii) Process water discharge and/or any waste water shall be properly treated to meet the prescribed standards before reuse/discharge. The runoff from temporary OB dumps and other surface run off shall be analyzed for iron and in case its concentration is found higher than the permissible limit, the waste water should be treated before discharge/reuse.

(xix) The decanted water from the beneficiation plant and slime/tailing pond shall be re-circulated within the mine and there shall be zero discharge from the mine.

(xx) Regular monitoring of the flow rate of the springs and perennial nallahs shall be carried out and records maintained.

(xxi) Regular monitoring of water quality, upstream and downstream of river shall be carried out and record of monitoring data should be maintained and submitted to Ministry of Environment and Forests, its Regional Office, Bhubaneswar, Central Groundwater Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board.

(xxii) Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with Regional Director, Central Ground Water Board.

(xxiii) Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral from mine face to the beneficiation plant. The vehicles shall be covered with a tarpaulin and shall not be overloaded.

(xxiv) Sewage treatment plant shall be installed for the colony. ETP shall also be provided for workshop and wastewater generated during mining operation.

(xxv) Digital processing of the entire lease area using remote sensing technique shall be carried out regularly once in three years for monitoring land use pattern and report submitted to Ministry of Environment and Forests and its Regional Office, Bhubaneswar.

(xxvi) Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.

(xxvii) The project proponent shall undertake all the commitments made during the public hearing and effectively address the concerns raised by the locals in the public hearing as well as during consideration of the project, while implementing the project.

(xxviii) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. All the safeguard measures brought out in the Wildlife Conservation Pan so prepared specific to the project site shall be effectively implemented. A copy of action plan shall be submitted to the Ministry of Environment and Forests and its Regional Office, Bhubaneswar.

(xxix) A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.

B. General Conditions

(i) No change in Iron Ore Processing/Beneficiation technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.

(ii) No change in the calendar plan including Processing/Beneficiation of mineral iron ore and waste should be made.

(iii) At least four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RSPM (Particulate matter with size less than 10 micron i.e., PM_{10}) and NO_X monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board. The data so recorded should be regularly submitted to the Ministry including its Regional office located at Bhubaneswar and the State Pollution Control Board / Central Pollution Control Board once in six months.

(iv) Measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs / muffs.

(v) There will be zero waste water discharge from the plant.

(vi) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.

(vii) Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.

(viii) A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.

(ix) The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneswar.

(x) The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.

(xi) The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.

(xii) The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the Ministry of Environment and Forests, its Regional Office Bhubaneswar, the respective Zonal Office of Central Pollution Control Board and the State Pollution Control Board. The proponent shall upload the status of compliance of the environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the Ministry of Environment and Forests, Bhubaneswar, the respective Zonal Officer of Central Pollution Control Board and the State Pollution Control Board.

(xiii) A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad/ Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.

(xiv) The State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and the Collector's office/ Tehsildar's Office for 30 days.

(xv) The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Office of the Ministry of Environment and Forests, Bhubaneswar by e-mail.

(xvi) The project authorities should advertise at least in two local newspapers of the District or State in which the project is located and widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forests at **http://envfor.nic.in** and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.

13. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.

14. Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of

this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

15. The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India/ High Court of Odhisa and any other Court of Law relating to the subject matter.

16. Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

(Dr. U. Sridharan)
Scientist 'F'

Copy to:

(i) The Secretary, Ministry of Mines, Government of India, Shastri Bhawan, New Delhi.
(ii) The Secretary, Department of Environment, Government of Odhisa, Secretariat, Bhubaneswar.
(iii) The Secretary, Department of Mines and Geology, Government of Odhisha, Secretariat, Bhubaneswar.
(iv) The Secretary, Department of Forests, Government of Odhisha, Secretariat, Bhubaneswar.
(v) The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
(vi) The Chief Conservator of Forests, Regional Office (EZ), Ministry of Environment and Forests, A-3 Chandrashekharpur, Bhubaneshwar-751023.
(vii) The Chairman, Odhisa State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneshwar-751012.
(viii) The Controller General, Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001.
(ix) The Member Secretary, Central Ground Water Authority, A2, W3 Curzon Road Barracks, K.G. Marg, New Delhi-110001.
(x) The District Collector, Keonjhar District, Government of Odhisa.
(xi) Record File.
(xii) MoEF Website

(Dr. U. Sridharan)
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